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**OPERATOR'S MANUAL (CREW)
FOR
GUN, AIR DEFENSE ARTILLERY,
TOWED
20-MM, M167A2
(NSN 1005-01-177-9237)**

This copy is a reprint which includes current pages from Changes 1 through 6.

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HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1987

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WARNING



DANGEROUS VOLTAGE

HIGH VOLTAGE is used in this system. Death or injury can result if you do not observe the safety precautions given in the instructions.

LOW VOLTAGE can also be dangerous. DO NOT be misled by this term. Potentials as low as 50 volts may cause death under certain circumstances.

WARNING

AN/VPS-2A RADAR SET

HIGH VOLTAGE is present in the receiver-transmitter (Unit 2) when the panel assembly is opened for servicing and the power is on. Be careful when changing radar frequency.

A potential RADIATION hazard exists when the radar is energized and transmitting. Stay at least 3 feet away from the center of the radar antenna when radar is transmitting.

WARNING

M168 CANNON

ALERT everyone in area before moving cannon. ALWAYS make sure cannon is aimed toward a safe area.

ALWAYS make sure CANNON IS CLEARED after firing and before servicing. When a cannon stoppage occurs and there is danger of a COOKOFF, take cover and wait for 30 minutes until cannon barrels have cooled before attempting to clear cannon. Make sure cannon is aimed toward a safe area.

If faulty ammunition is suspected, immediately stop firing and take cover until danger of a HANGFIRE has passed. Make sure cannon is aimed toward a safe area.

WARNING

AMMUNITION

Electrically-primed ammunition can fire if exposed to high-power radio frequency fields. Avoid contact of any kind with the primer, especially metal objects.

Rechambering of live ammunition is prohibited. This can result in a HANGFIRE that can cause injury or death of personnel as well as damage to the system.

WARNING

REFUELING

When refueling the APU, make a metal-to-metal contact between the fuel tank and the filling device to prevent static electricity buildup. Observe all safety rules re-

For further first aid

For further first aid

FM 21-11.



WARNING



ACQ/TRK

Place NORM/STATIC/TEST switch to STATIC prior to power ON OFF. ACQ/TRK pushbutton must be pressed prior to squeezing action switch to obtain turret movement. Releasing the ACQ/TRK pushbutton in manual, or external modes will allow lead angle insertion (sudden turret movement).

WARNING

While operating in the RADAR, MANUAL, EXTERNAL or the TEST MODES, do not attempt to command the cannon in elevation after it has reached maximum elevation (contacted the mechanical stop). The turret will rotate unexpectedly at an uncontrolled rate until the action switches are released.

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY

No. 9-1005-318-10

WASHINGTON, D.C., 8 JULY 1987

OPERATION AND MAINTENANCE MANUAL
(CREW) FOR
GUN, AIR DEFENSE ARTILLERY, TOWED,
20MM, M167A2 (NSN 1005-01-177-9237)

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of the manual and mail the form direct to Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAS, Rock Island, IL 61299-6000. A reply will be furnished directly to you.

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CHAPTER 1 INTRODUCTION

SECTION I . GENERAL

1-1 Scope. This manual provides crew operating and maintenance instructions for the M167A2 towed system and its auxiliary equipment. Use this manual to maintain your proficiency and to keep your M167A2 in peak condition.

1-2 Reporting of Equipment Improvement Recommendations (EIR). If your equipment needs improvement, let us know. Send us an EIR. As the user, you are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or why a procedure is hard to perform. Put your comments on an SF 368 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-QAD, Rock Island, IL 61299-6000. A reply will be furnished to you.

SECTION II . DESCRIPTION AND DATA

1-3 Description. The M167A2 towed air defense system is a lightweight, carriage-mounted weapon. It is towed by the M561 gamma goat or by 1-1/2 ton or larger vehicles. The M167A2 provides close-in defense against air and ground threats. The major components of the M167A2 are the M168 20MM cannon, the M61A1 sight, the M42A2 gun carriage, and the AN/VPS-2A radar set. Additional details are shown on the following pages. If you want more information on the components, ask your organizational maintenance for a copy of TM 9-1005-318-20-1.

NOMENCLATURE CROSS REFERENCE

<u>Common Name</u>	<u>Official Nomenclature</u>
Sight	Optical Sight M61A1
Carriage	Gun Carriage M42A2
Mount	Gun Mount M167
Control Panel	Control Assembly
Converter	Voltage Converter
FCP	Fire Control Processor
D-Box	System Distribution Box
Radar	Radar Set AN/VPS-2A
Stow Control	Radar Distribution Box (Unit 6)
Cannon	Air Defense Gun Cannon M168
APU (Auxiliary Power Unit)	Generator Set, Gasoline Engine

M167A2 GUN SYSTEM

WEIGHTS AND DIMENSIONS

Ready for Travel

Weight	1583 kg (3490 lb)
Length	472.4 cm (186 in)
Width	246.7 cm (97.11)
Track	227.1 cm (89.42 in)
Height	205.7 cm (81.00 in)
Maximum Towing Speed	72.42 kph (45 mph)
Fording Depth (APU removed)	93.98 cm (37 in)
Fording Depth (APU installed)	43.2 cm (17 in)
Emplaced with Cannon In Travel Lock	
Length	386.1 cm (152 in)
Width	370.8 cm (146 in)
Height	182.9 cm (72 in)
Clearance (Traversing)	444.5 cm (175 in)
Height (Cannon Full Elevation)	292.1 cm (115 in)
Terrain Level	10 ⁰ max slope

PERFORMANCE

Firing Rate - Rounds per Minute

High Rate	3000
Low Rate	1000
Burst limits - high rate only	10, 30, 60 or 100 rds

RADAR RANGE

Minimum	250 meters
Maximum	5000 meters (1 sq meter target)

TIRE PRESSURE

TERRAIN	TIRE PRESSURE	MAXIMUM SPEED
Hard (paved, packed sand, hard clay)	310 kPa (45 PSI)	72 Kmh (45 MPH)
Medium (spadable clay, sod)	207 kPa (30 PSI)	48 Kmh (30 MPH)
Soft (loose sand, mud)	103 kPa (15 PSI)	8 Kmh (5 MPH)

WEIGHT AND BALANCE INFORMATION FOR AIRBORNE TRANSPORT**167A2**

Without Basic Issue Items 1,542 kg (3,400 lb)

APU

Without Fuel 61 kg (134 lb)

With Fuel 64 kg (140 lb)

Ammunition Links

Per Link 42.5 g (1.5 oz)

Ammunition

M246/M246A1
4070 grains 24 kg (0.53 lb)

M56A3/M56A4
4000 grains 23.6 kg (0.52 lb)

M220
3935 grains 23 kg (0.51 lb)

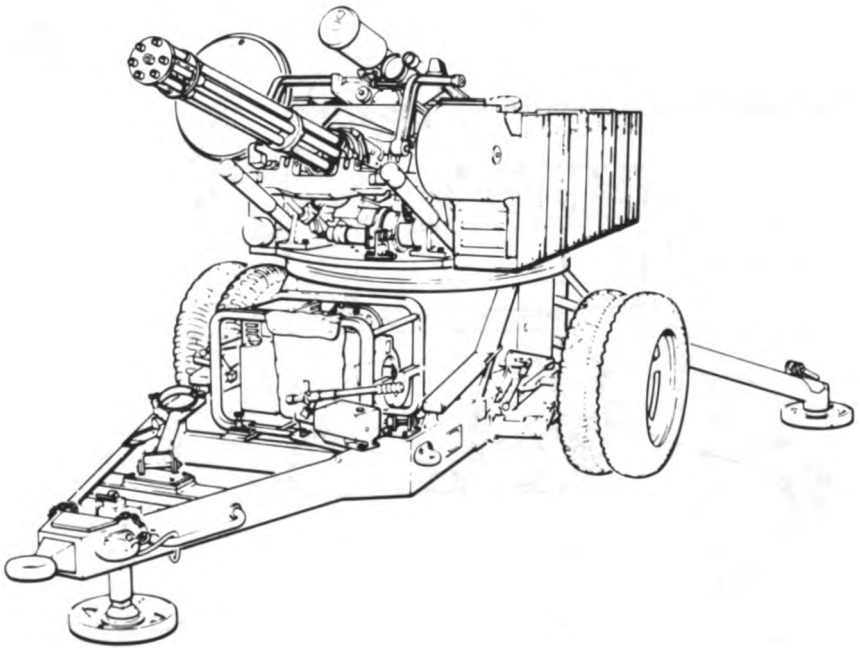
M55A2
3935 grains 23 kg (0.51 lb)

1 grain = 0.059 grams (0.002083 ounce)

28.35 grams (1 ounce) = 480 grains

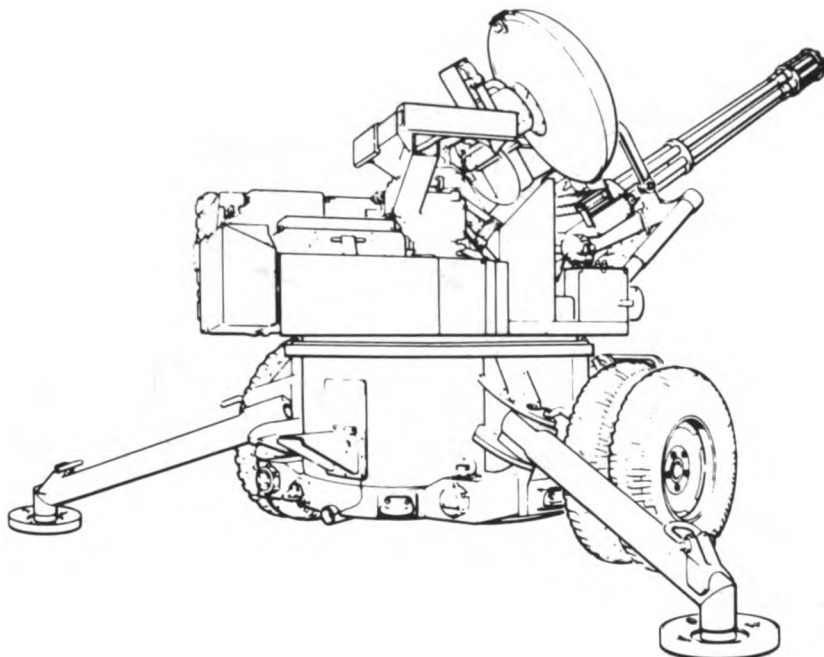
0.45359 kg (1 pound) = 7680 grains

M167A2 GUN SYSTEM—Continued



**M167A2 TOWED 20-MM AIR DEFENSE GUN
(FRONT VIEW, EMLACED)**

M167A2 GUN SYSTEM—Continued



**M167A2 TOWED 20-MM AIR DEFENSE GUN
(REAR VIEW, EMPLACED)**

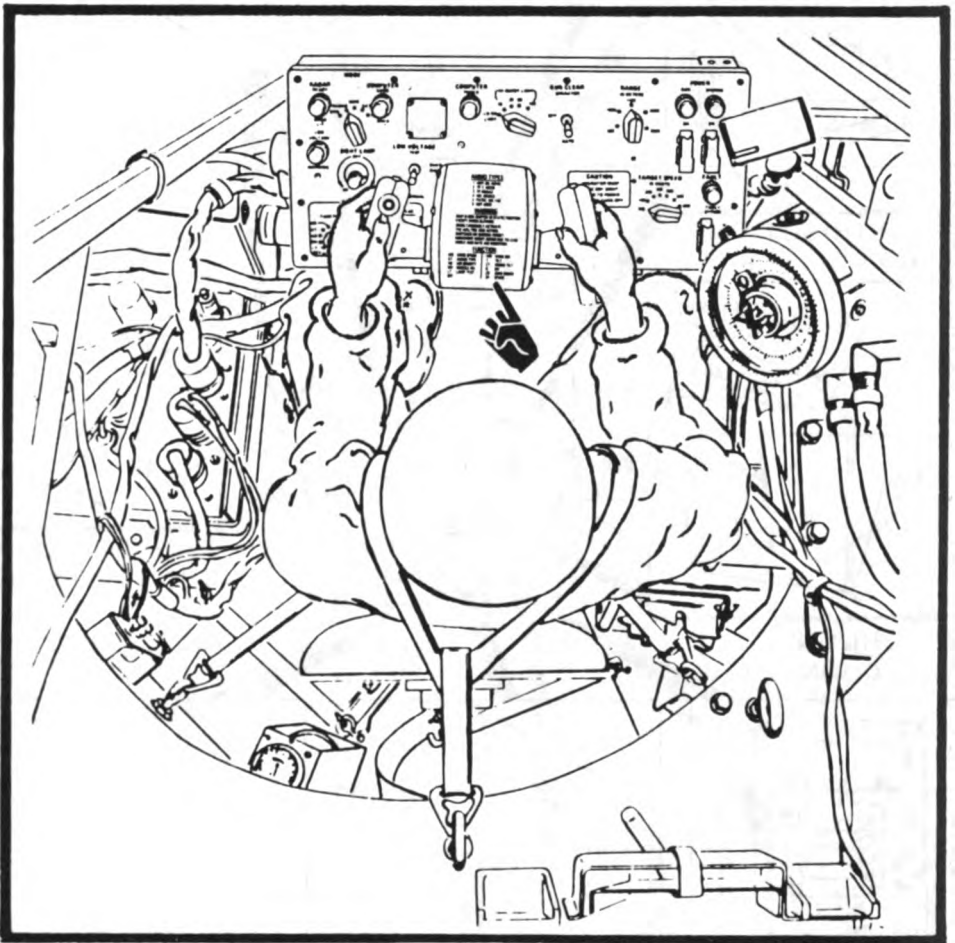
CHAPTER 2

OPERATING INSTRUCTIONS

SECTION I .

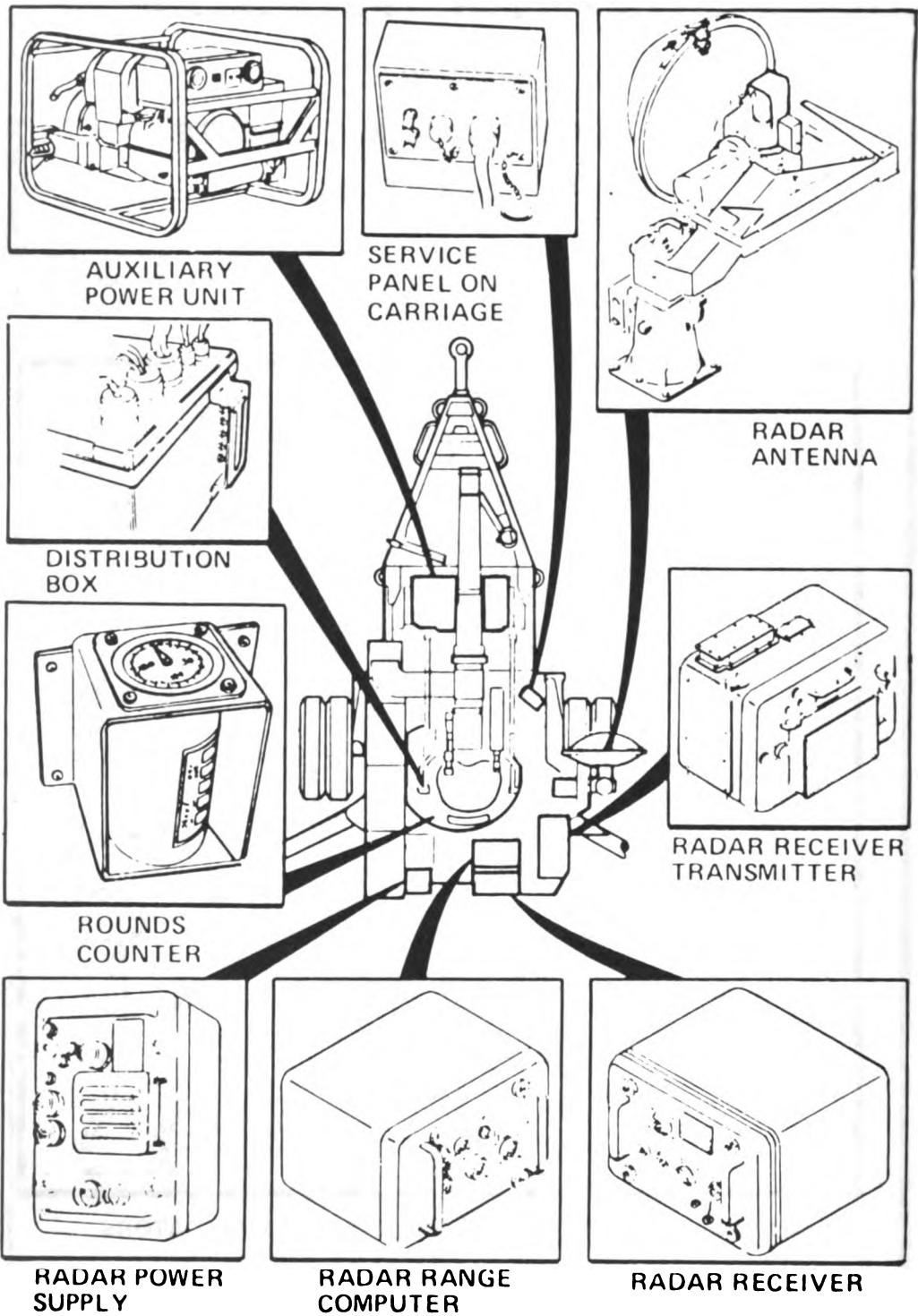
M167A2 CONTROLS, INSTRUMENTS, AND INDICATORS

2-1 Know Your Controls and Instruments. Before you attempt to operate your equipment, make certain that you are familiar with the location and operation of all controls and instruments.

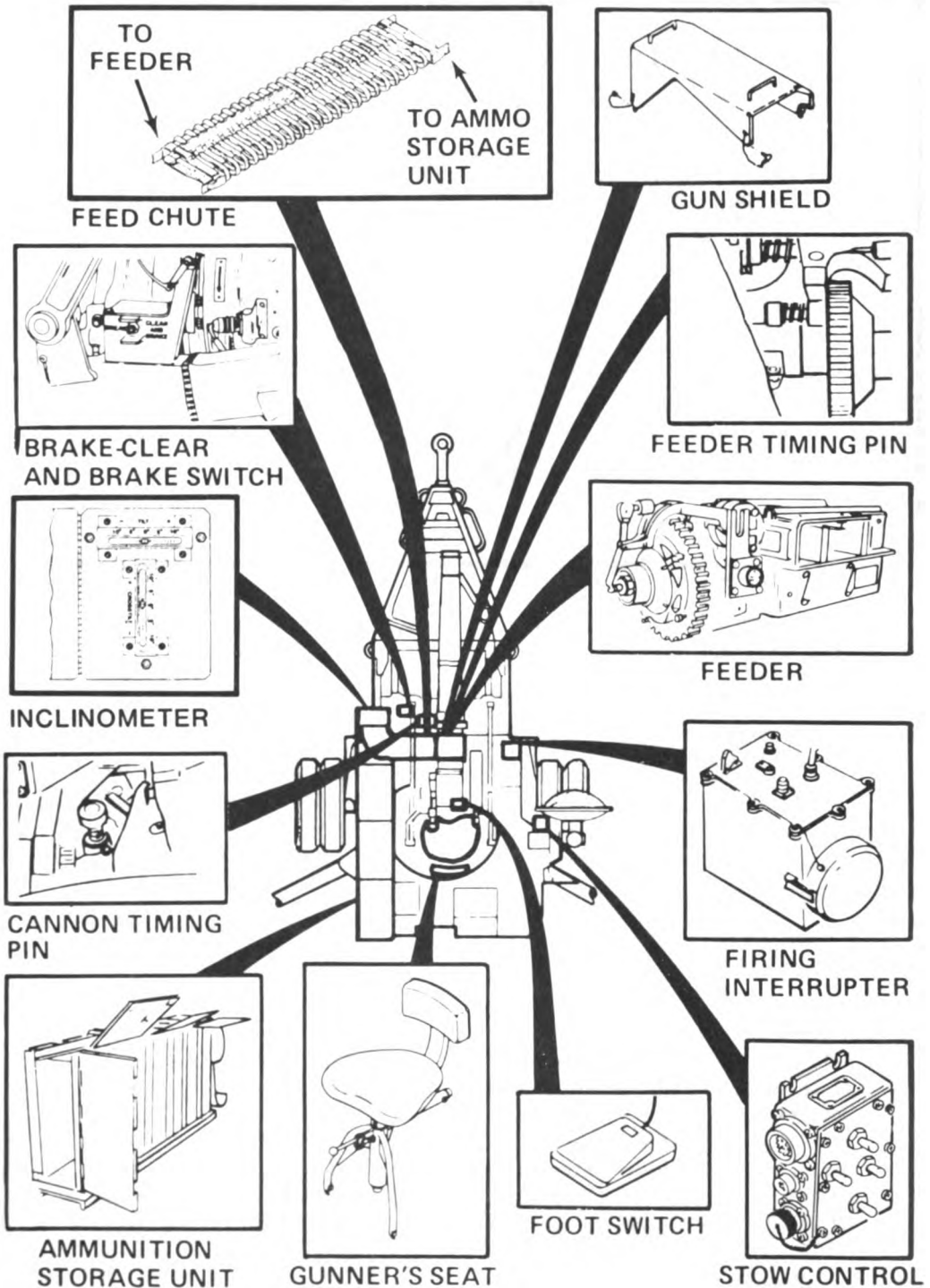


GUNNER'S CONTROLS, INSTRUMENTS, AND INDICATORS

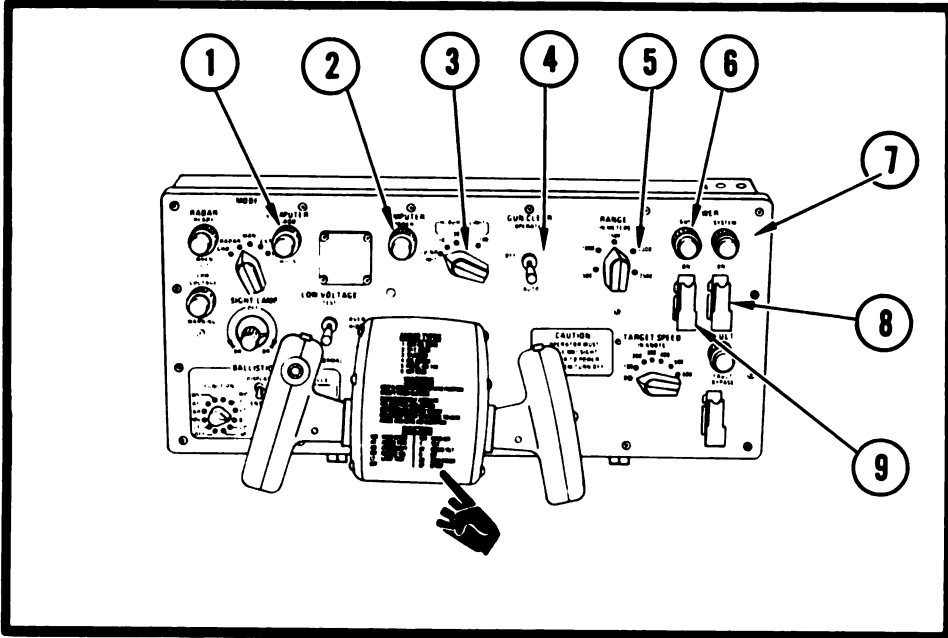
SYSTEM COMPONENTS LOCATION



SYSTEM COMPONENTS LOCATION - Continued

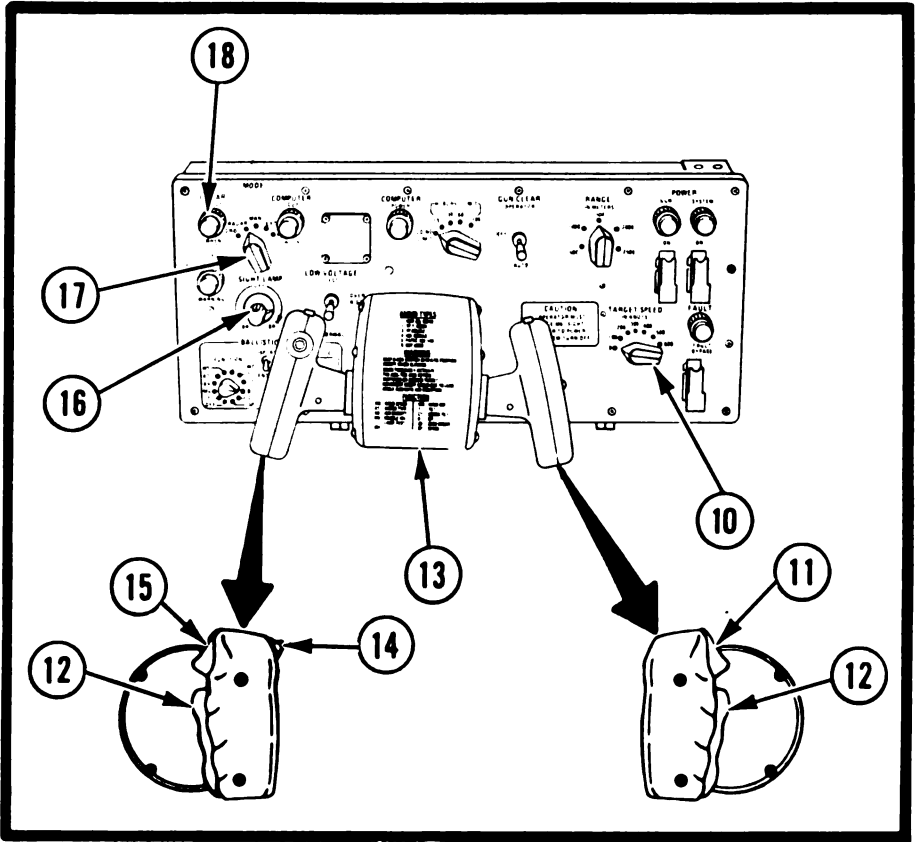


MOUNT CONTROL ASSEMBLY



1. COMPUTER GOOD WHEN LIT indicator - lit continuously when computer is operational
2. COMPUTER POWER indicator - lit continuously when power available to computer
3. FIRING RATE switch -
LO-NO LIMIT
HI-BURST LIMIT - 10 rounds
30 rounds
60 rounds
100 rounds
4. GUN CLEAR switch -
AUTO - gun clears automatically - leave switch in this position during operation
OFF - gun does not clear after firing - DO NOT leave switch in this position
OPERATOR - gun cleared by operator
5. RANGE IN METERS knob - sets estimated target range in MAN mode
6. GUN POWER indicator - lit when power applied to firing circuits
7. SYSTEM POWER indicator - lit when power applied to system
8. SYSTEM POWER switch - applies power to system
9. GUN POWER switch - applies power to gun firing circuits

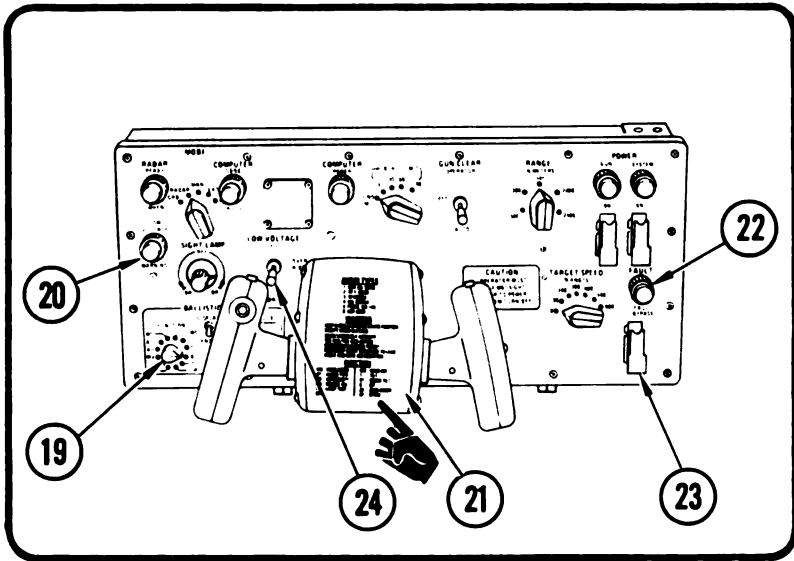
CONTROL ASSEMBLY - Continued



10. TARGET SPEED IN KNOTS knob - sets estimated speed in MAN and EXT modes
11. Trigger switch (right handle) - fires cannon
12. Action switch (left and right handles) - enables system actions
13. Elevation control - controls mount in azimuth and elevation
14. ACQ/TRK pushbutton - prevents ballistics solution when depressed, starts solution when released. It must be pressed simultaneously with action switch to initiate turret Movement, in the manual, external and radar modes.
15. Trigger switch (left handle) - dummy - no function
16. SIGHT LAMP knob - controls sight reticle brightness
17. MODE switch -
 - GRD - radar circuits disabled
 - RADAR - target range and speed set automatically
 - MAN - target range and speed set by operator
 - EXT - range set by external range control, speed by operator
 - TEST - used in BIT checks
18. RADAR READY WHEN LIT indicator - lit when radar is ready (after 2-1/2 minutes warmup)

MOUNT – Continued

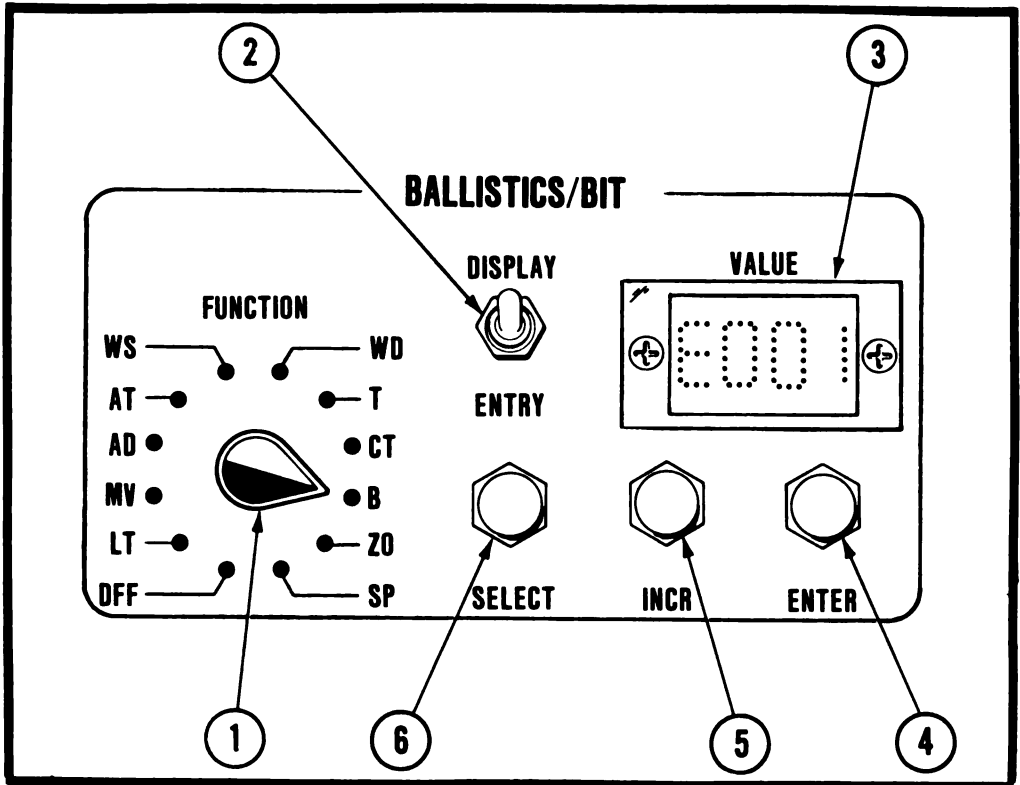
CONTROL ASSEMBLY – Continued



19. BALLISTICS/BIT subpanel - enters ballistics values and displays messages
20. LOW VOLTAGE WARNING indicator -
Flashing - warns that system voltage has dropped below 22.0 volts
Lit continuously - warns that system voltage has dropped below 20.5 volts and automatically shuts down voltage converter, sight gyros, radar, and FCP
21. AMMO TYPES/FUNCTION decal - identifies ammunition types and BALLISTICS/BIT FUNCTION switch settings
22. FAULT indicator -
Slow flash (once per second) - fault not in mode selected
Fast flash (four times per second) - fault in selected mode
23. FAULT BYPASS switch - permits operation in mode with fault
24. LOW VOLTAGE switch -
NORMAL - enables low voltage protective circuits which warn of low voltage condition and shut system down
OVERRIDE - overrides low voltage protection circuits and allows continued operation or restoration of power under low voltage conditions
TEST - tests low voltage protection circuits

MOUNT – Continued

CONTROL ASSEMBLY – BALLISTICS/BIT SUBPANEL



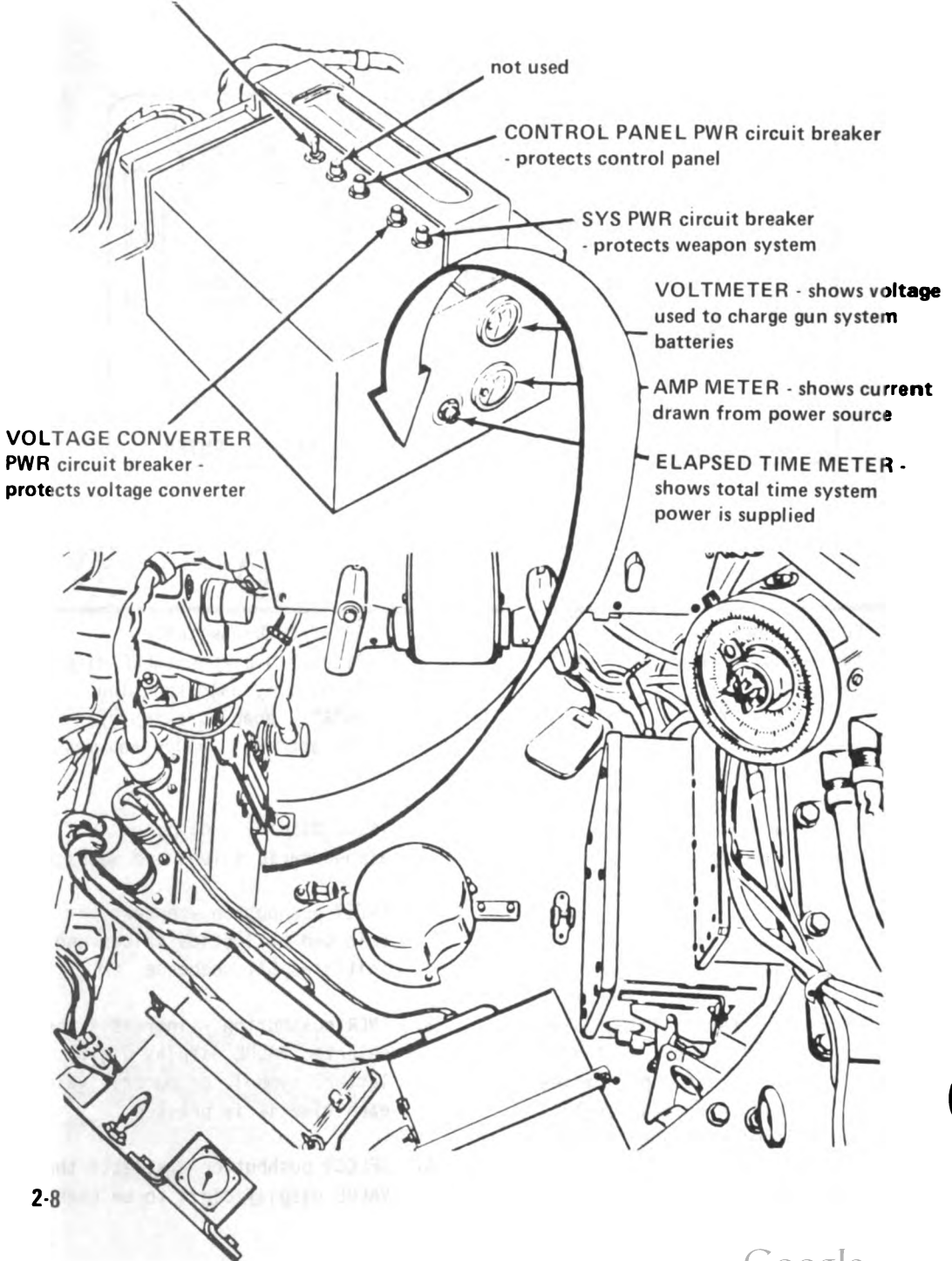
1. **FUNCTION switch** - selects functions to be entered or displayed
 - LT - lamp test - lights all segments of VALUE display
 - MV - muzzle velocity
 - AD - air density
 - AT - ammunition type
 - WS - wind speed
 - WD - wind direction
 - T - tilt
 - CT - crosstilt
 - B - built in test
 - ZO - zero order - special function for training only
 - 0 level - provides lead angle and rate aid capabilities
 - 1 level - no lead angle
 - 2 level - no lead angle or rate aid
 - SP - spare - not used
2. **DISPLAY/ENTRY switch** -
 - DISPLAY - places VALUE display in display only function
 - ENTRY - enables entry of alphanumeric values and messages
3. **VALUE display** - displays alphanumeric values and messages
4. **ENTER pushbutton** - enters selected ballistics values and initiates BIT sequence
5. **INCR pushbutton** - increases the selected VALUE display digit, letter, symbol, or numeric value each time it is pressed
6. **SELECT pushbutton** - selects the VALUE display digit to be changed

NORM/STATIC/TEST switch -

NORM - system operates normally

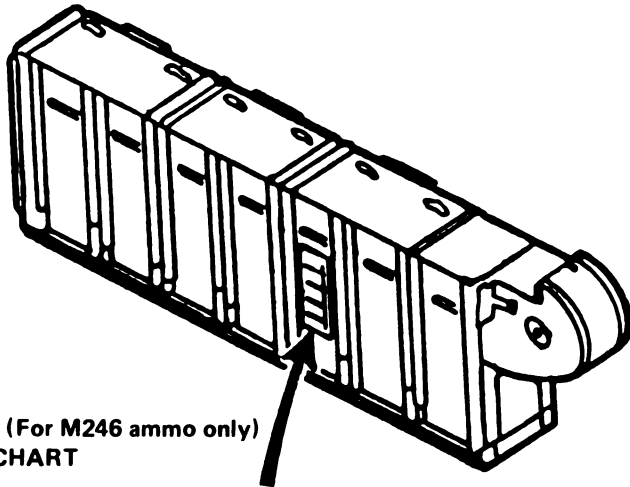
STATIC - azimuth motor and elevation drive are powerless and brakes ON

TEST - not used



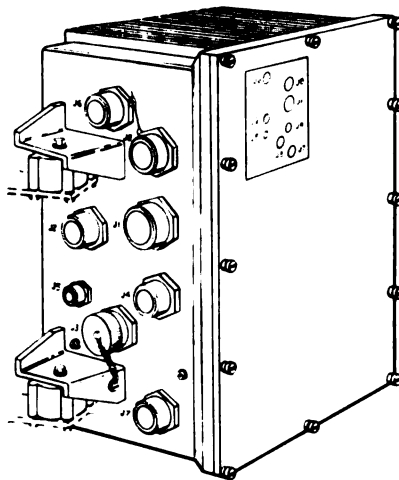
MOUNT — Continued

500 ROUND AMMUNITION STORAGE UNIT



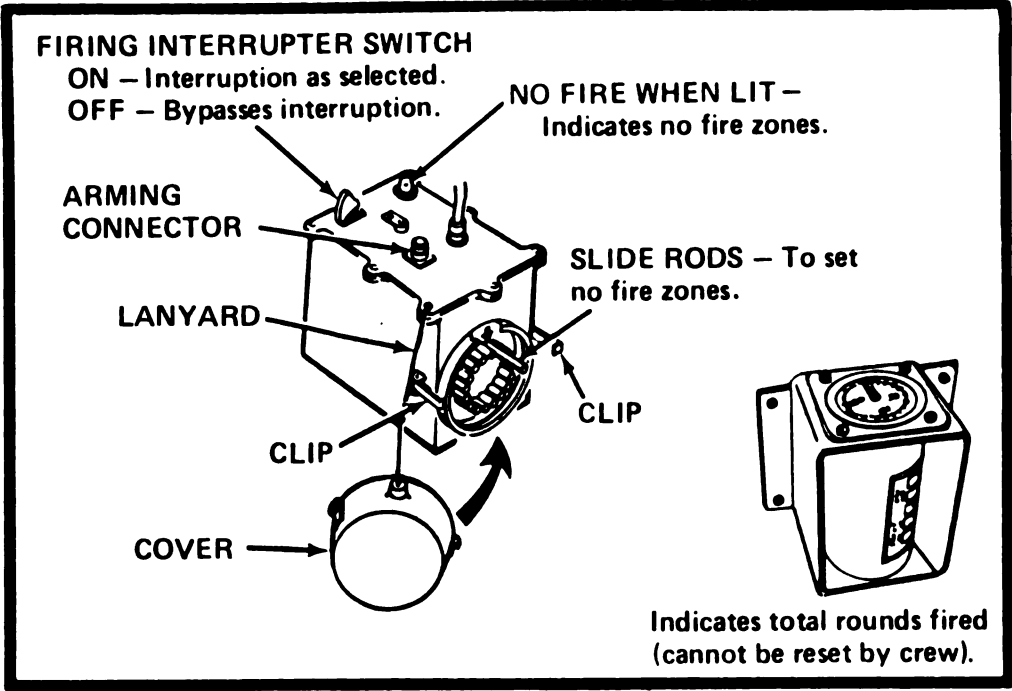
MUZZLE VELOCITY (For M246 ammo only)
AND AIR DENSITY CHART

FIRE CONTROL PROCESSOR

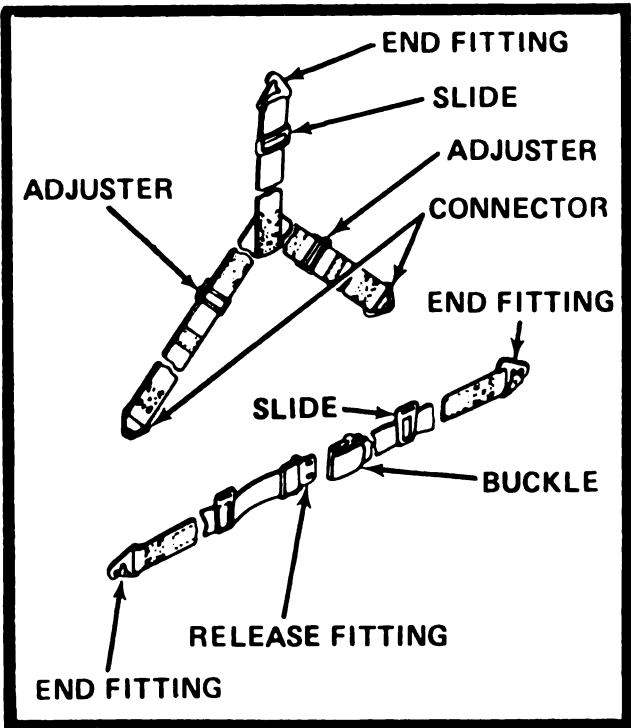


MOUNT – Continued

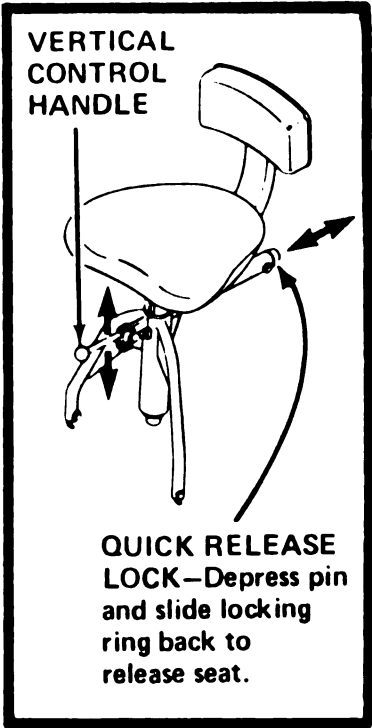
FIRING INTERRUPTER AND ROUNDS COUNTER



SHOULDER HARNESS AND SEAT BELT

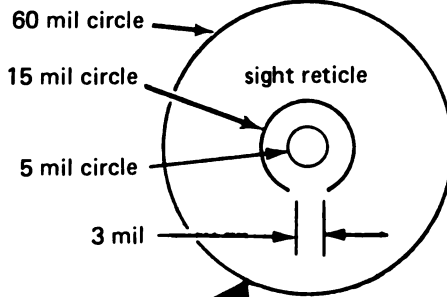


GUNNER'S SEAT



MOUNT – Continued

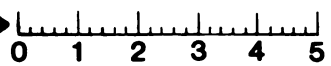
M61A1 SIGHT



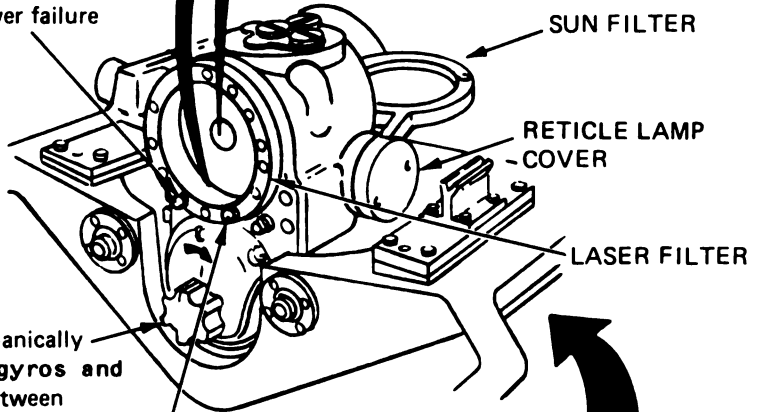
TRACK/JAM/RADIATE indicator (yellow) -

- Lit continuously - target tracked
- Slow flash (once per second) - radar experiencing jamming
- Fast flash (four times per second) - radar power failure

TARGET RANGE (km)



TARGET RANGE meter - indicates target range in the radar mode.

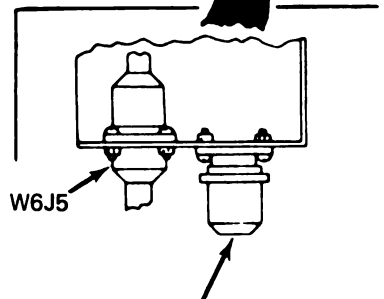


CAGED knob - mechanically cages and uncages gyros and provides interlock between sight and system power

READY TO FIRE indicator - lit when conditions permit firing in RADAR and EXT modes

CAUTION

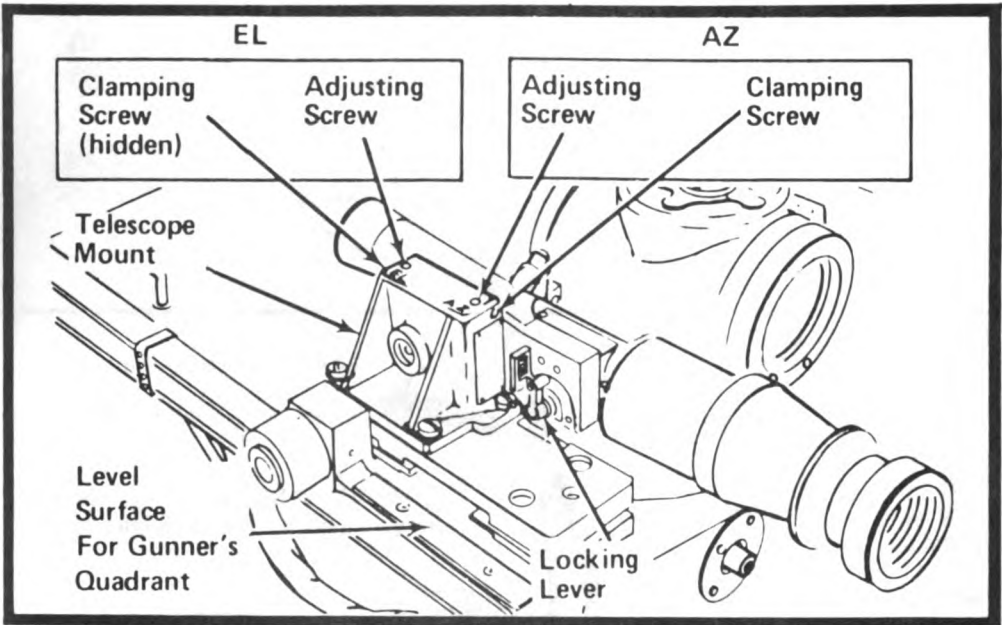
Always cage sight when not in use and before turning system power ON or OFF. Uncage sight immediately after system power turned ON to prevent BIT sight failures and fire control mode restrictions.



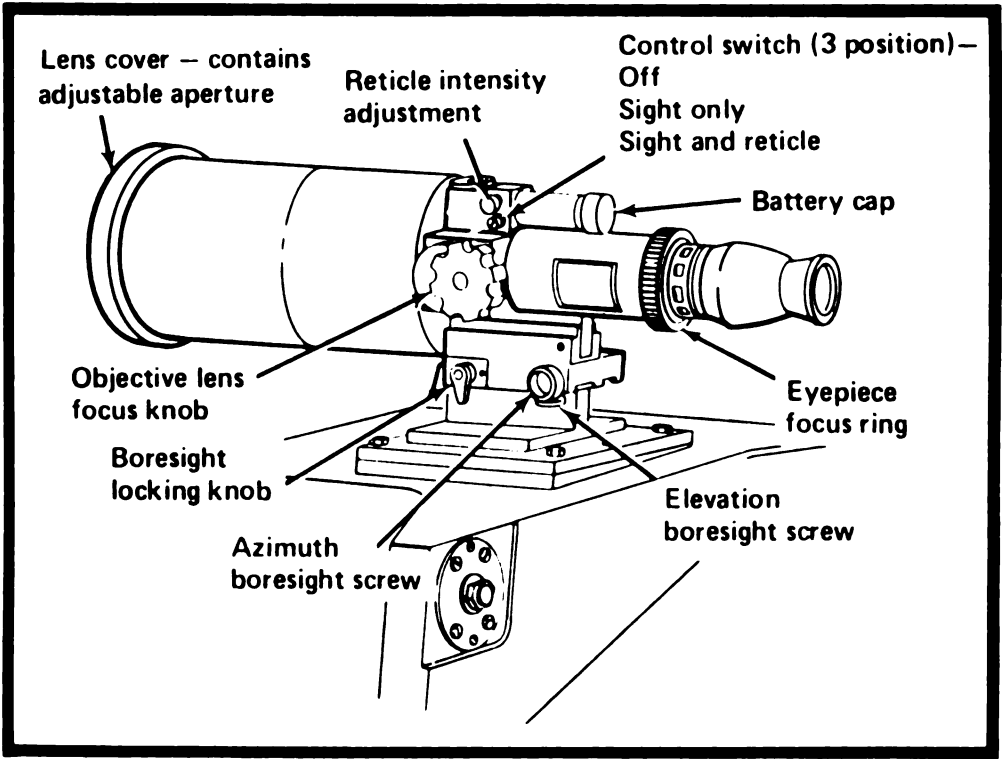
SHORTING CONNECTOR - install on W6J5 only if caged knob switch malfunctions in a critical situation

MOUNT – Continued

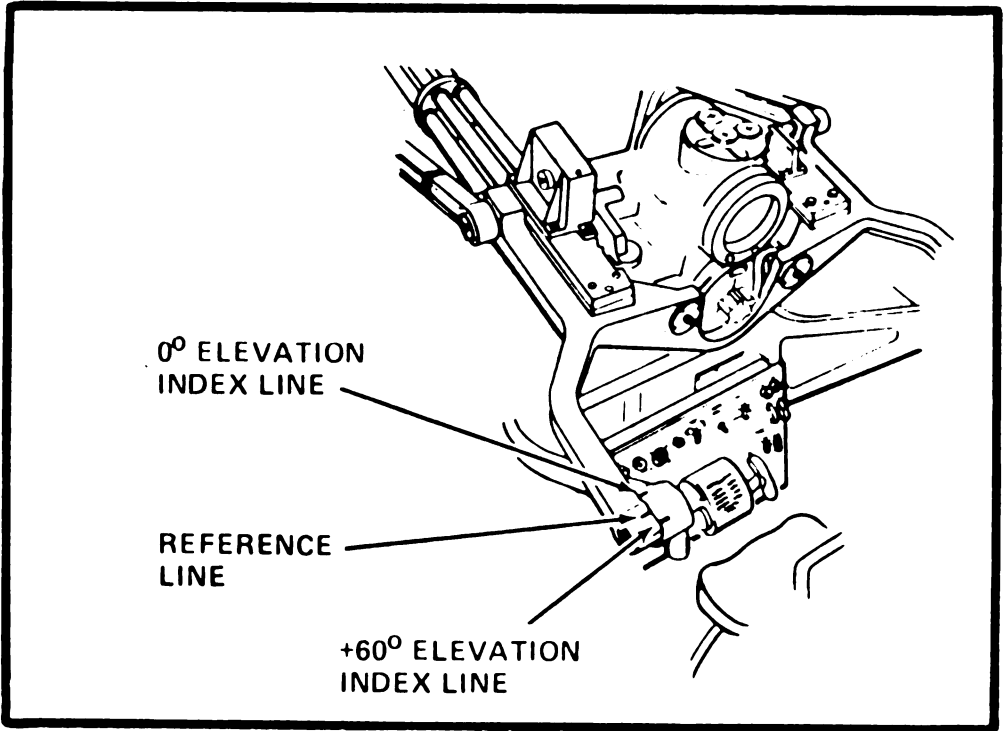
M134 TELESCOPE AND M164 MOUNT



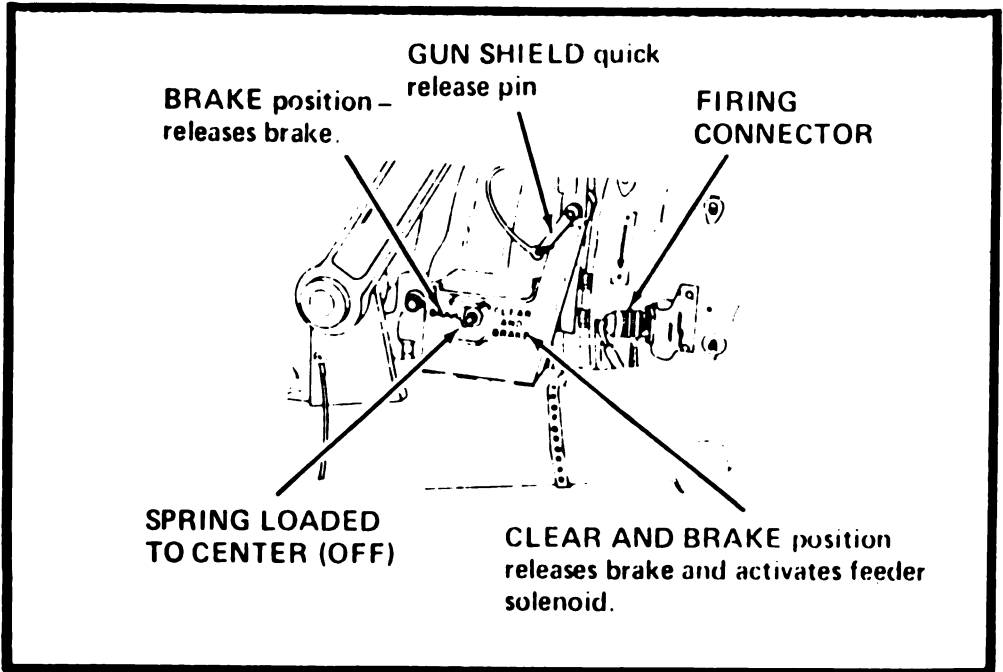
AN/TVS-2B OR AN/TVS-5 NIGHT VISION SIGHT



MOUNT INDEX MARKS

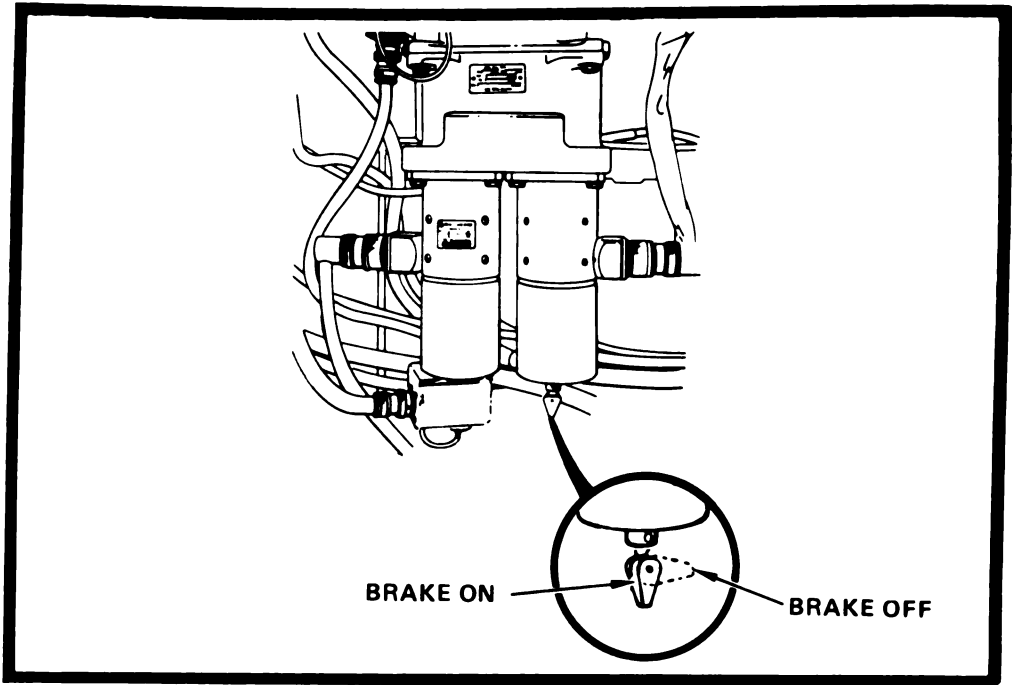


BRAKE-CLEAR AND BRAKE SWITCH

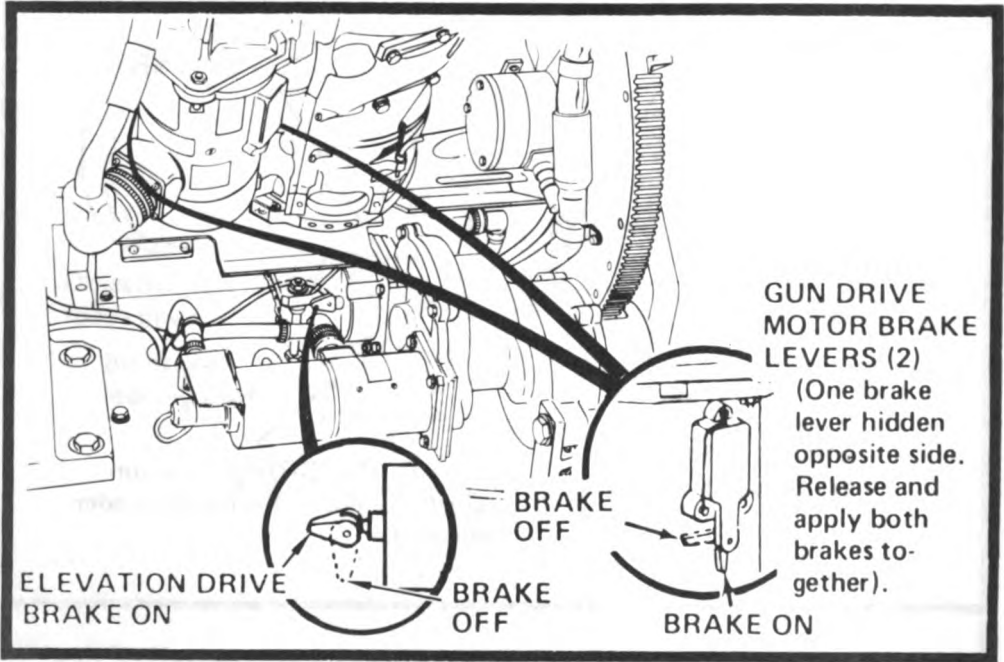


MOUNT – Continued

AZIMUTH DRIVE MOTOR BRAKE LEVER

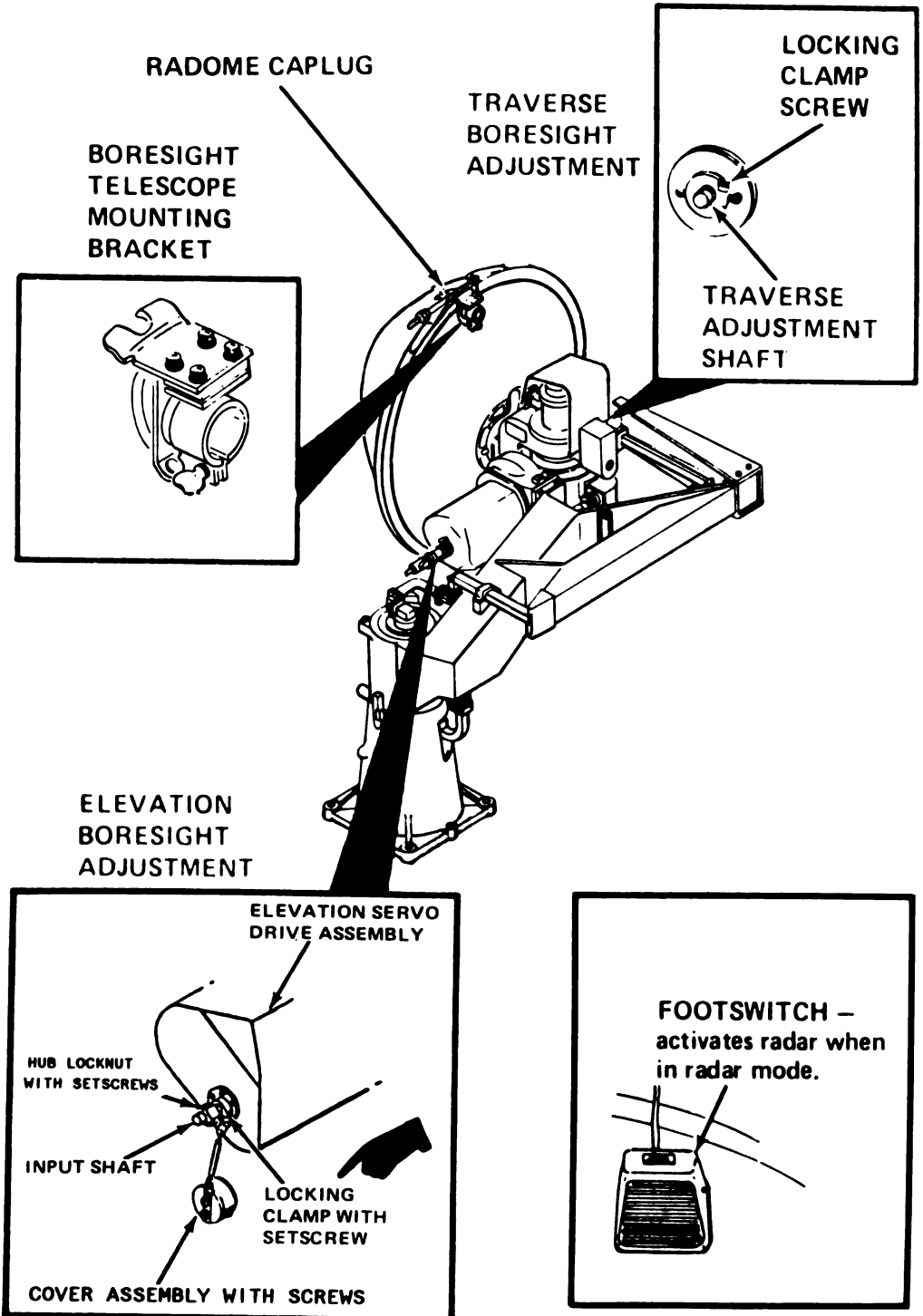


ELEVATION & GUN DRIVE MOTOR BRAKES



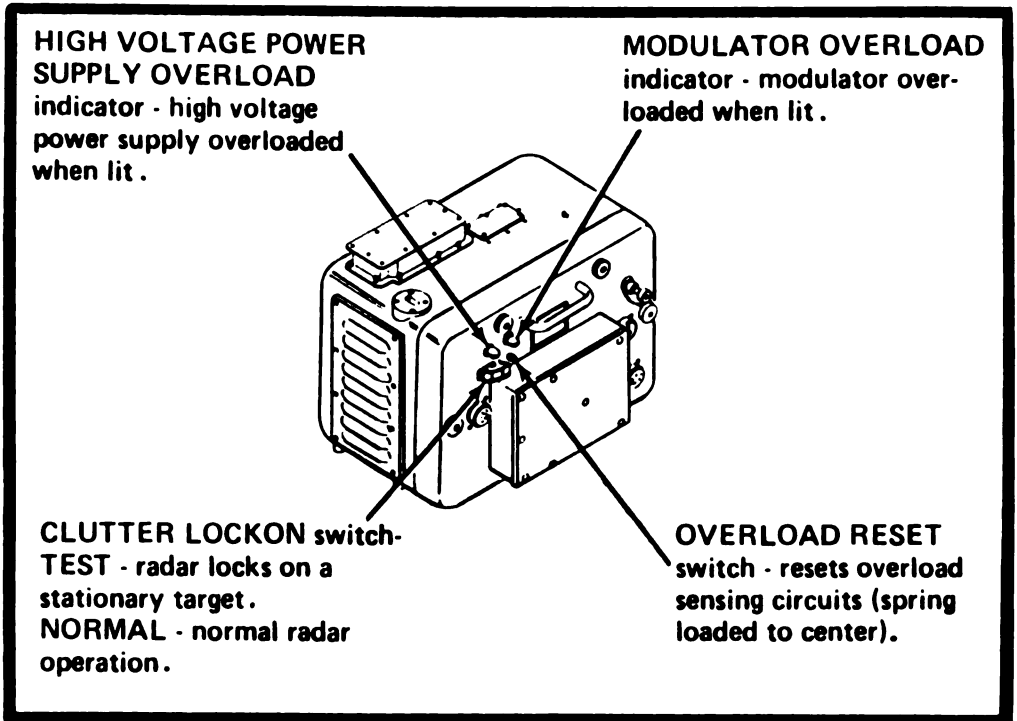
RADAR COMPONENTS

RADAR ANTENNA (UNIT 1) AND FOOTSWITCH

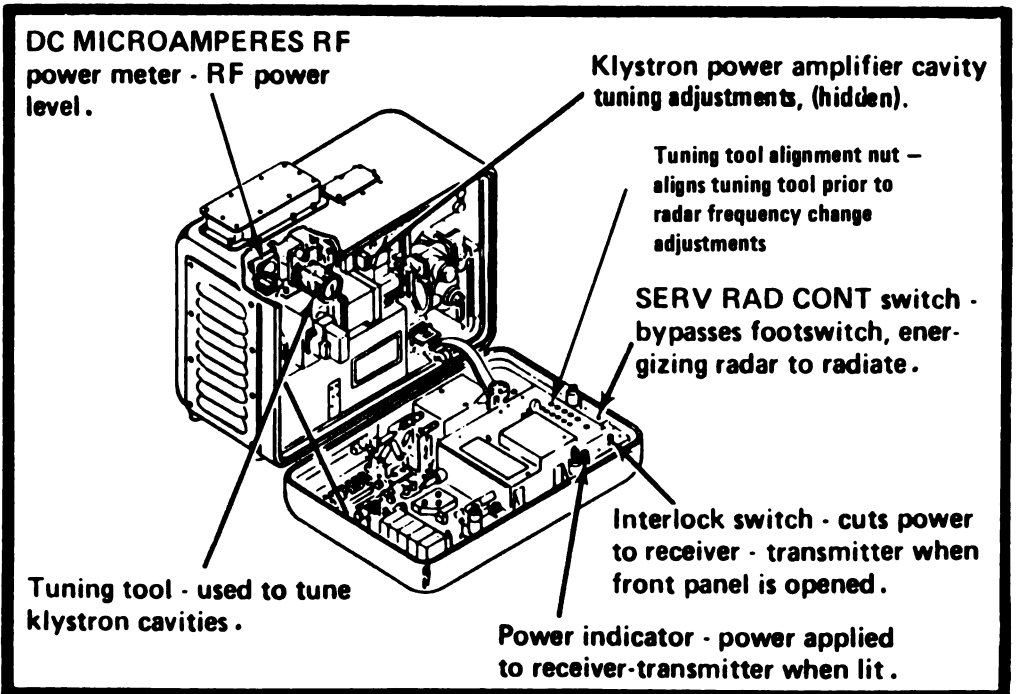


RADAR COMPONENTS – Continued

RADAR RECEIVER-TRANSMITTER (UNIT 2)

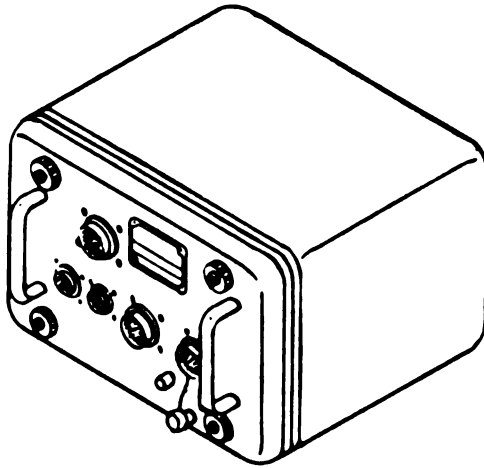


PANEL OPENED



RADAR COMPONENTS – Continued

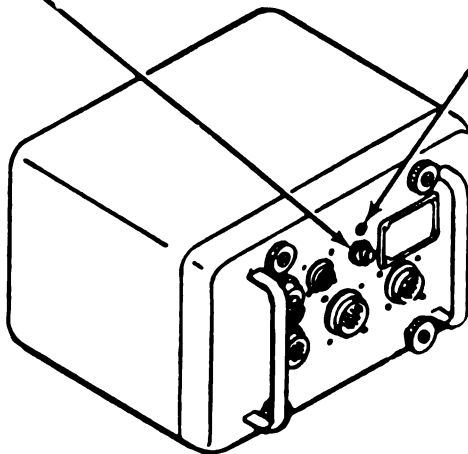
RADAR RECEIVER (UNIT 3)



RADAR RANGE COMPUTER (UNIT 4)

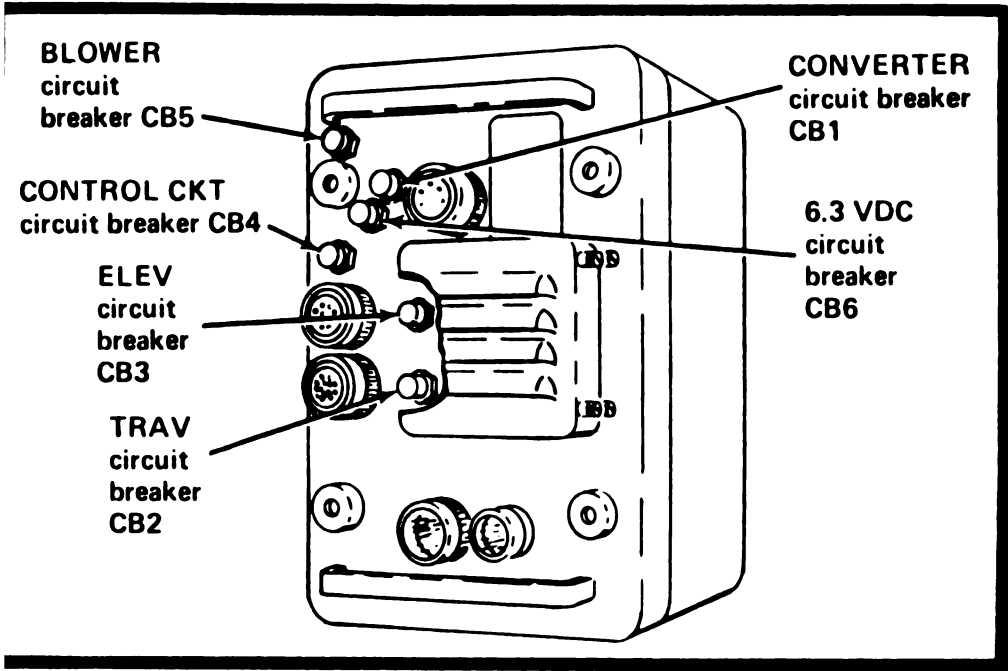
**MID RANGE CALIBRATION
PRESS TO TEST** pushbutton
switch

Indicator normally flashes
once per second; during
test condition, stays lit if
test is good

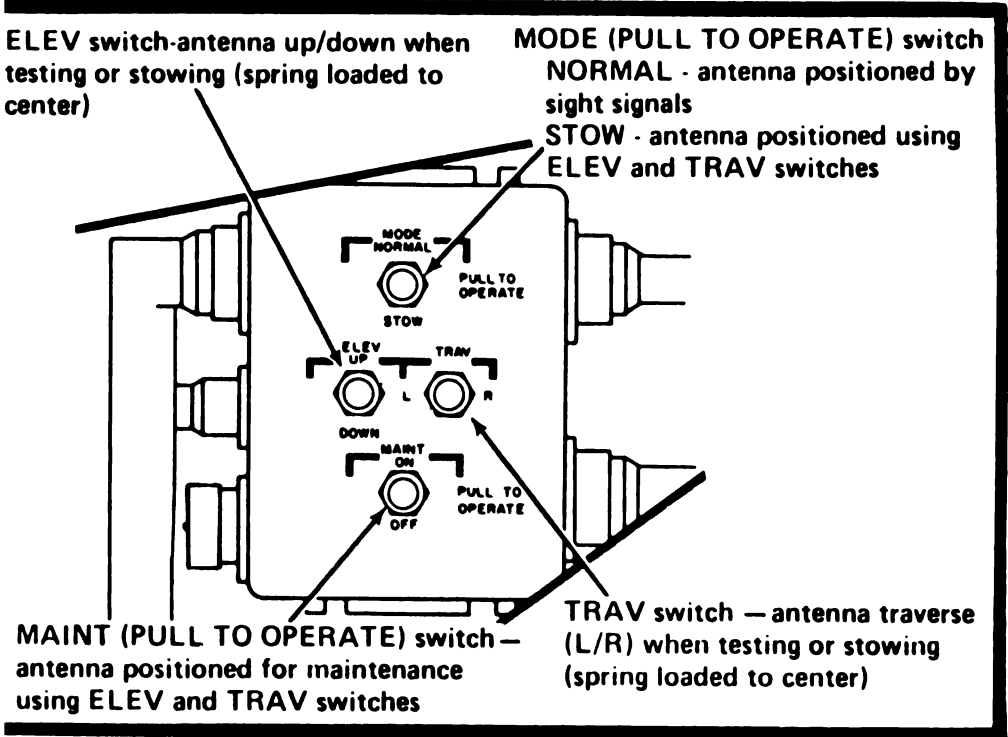


RADAR COMPONENTS – Continued

RADAR POWER SUPPLY (UNIT 5)

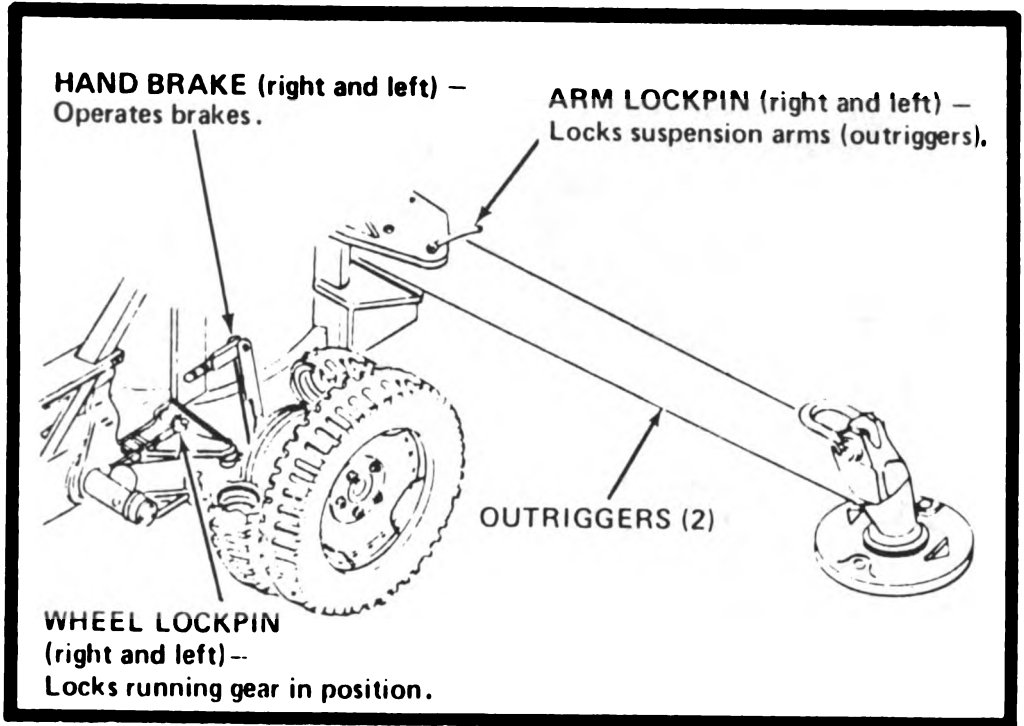


DISTRIBUTION BOX (STOW CONTROL) UNIT 6

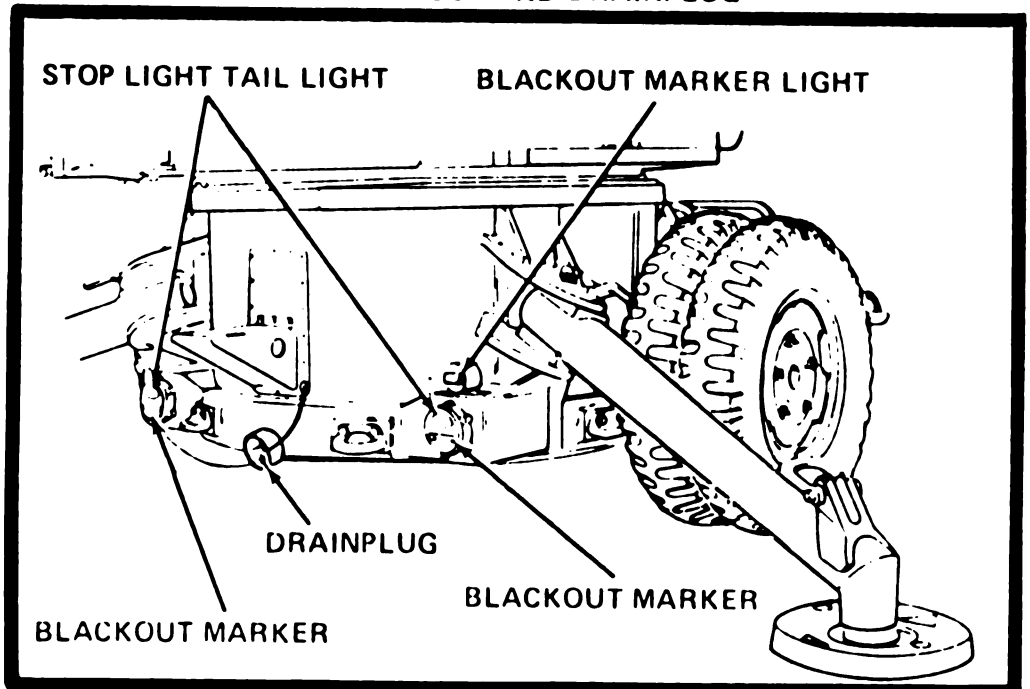


CARRIAGE

LOWER CARRIAGE CONTROLS

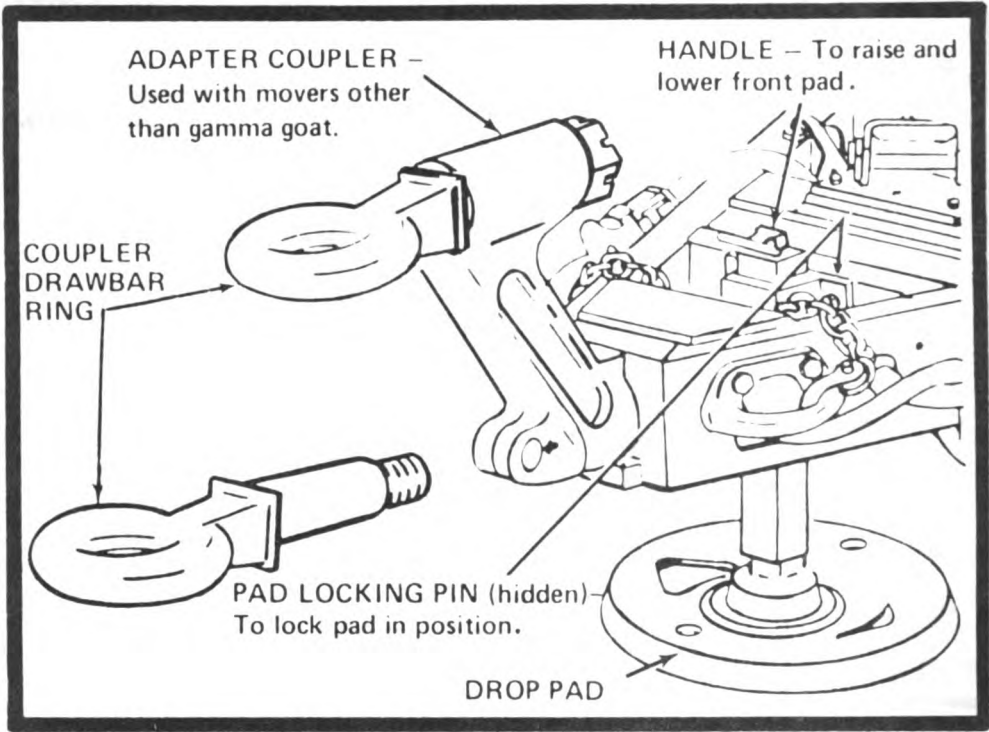


LIGHT GROUP AND DRAINPLUG

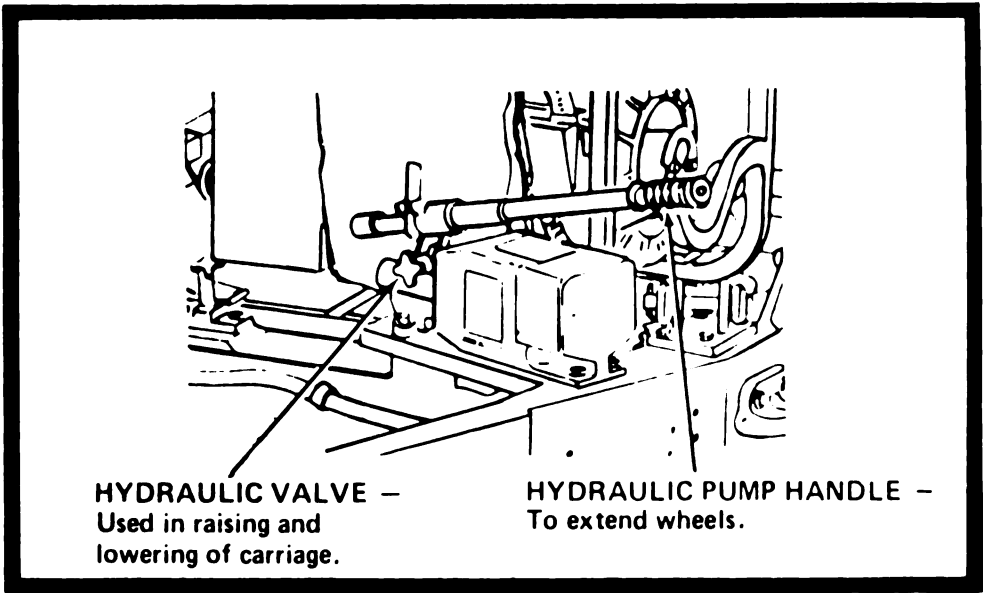


CARRIAGE – Continued

FRONT DROP PAD AND COUPLER RING

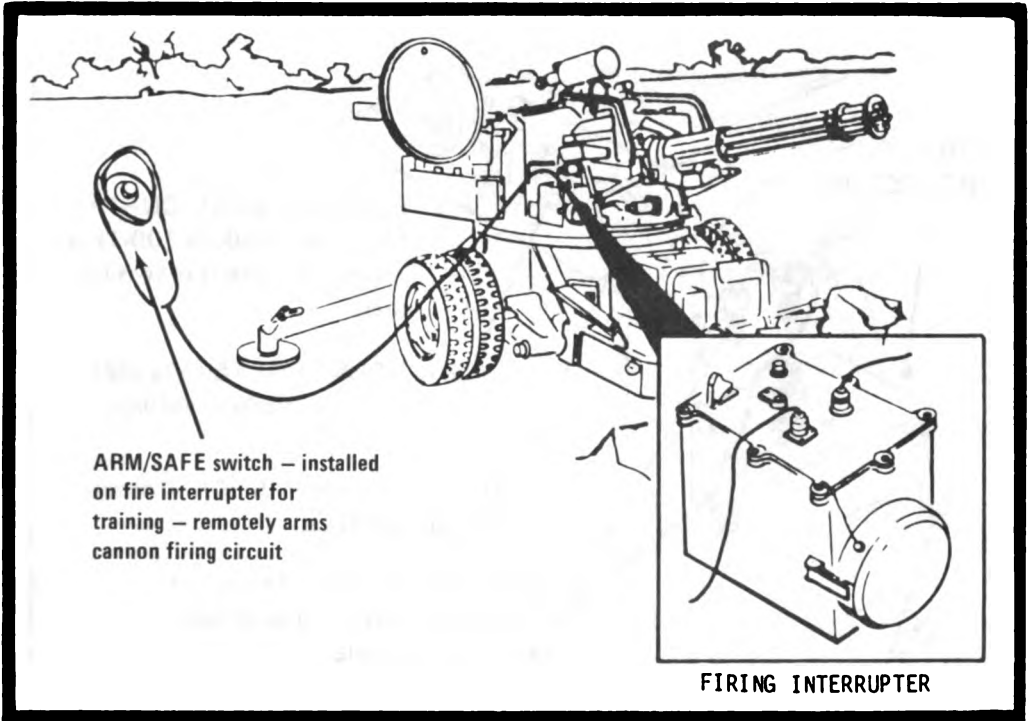


HYDRAULIC SYSTEM CONTROLS

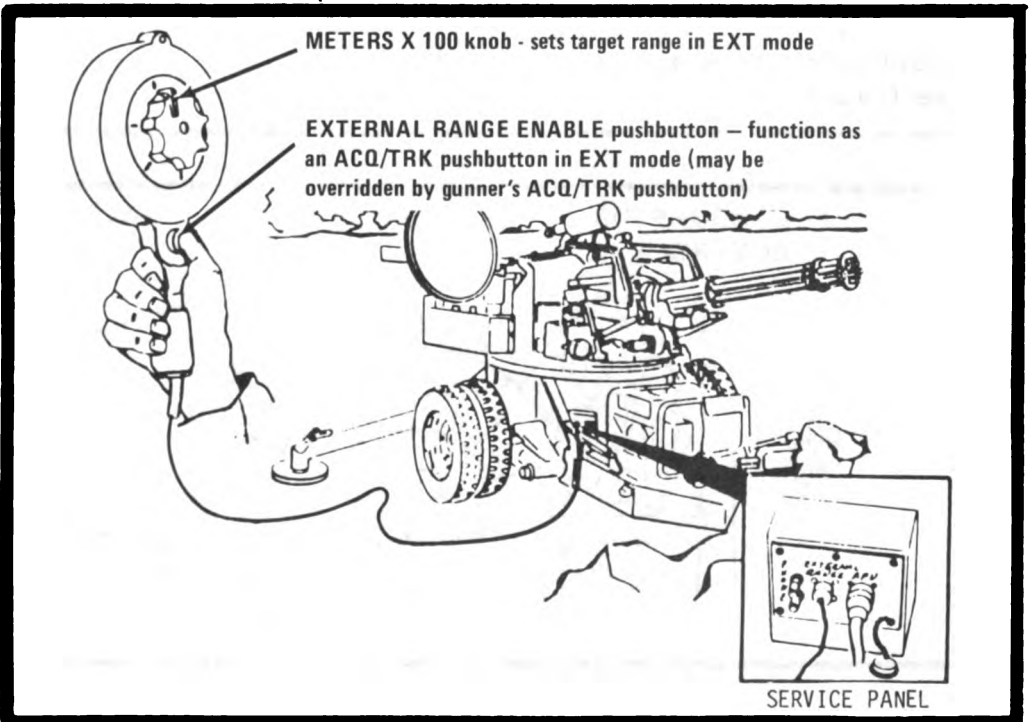


EXTERNAL CONTROLS

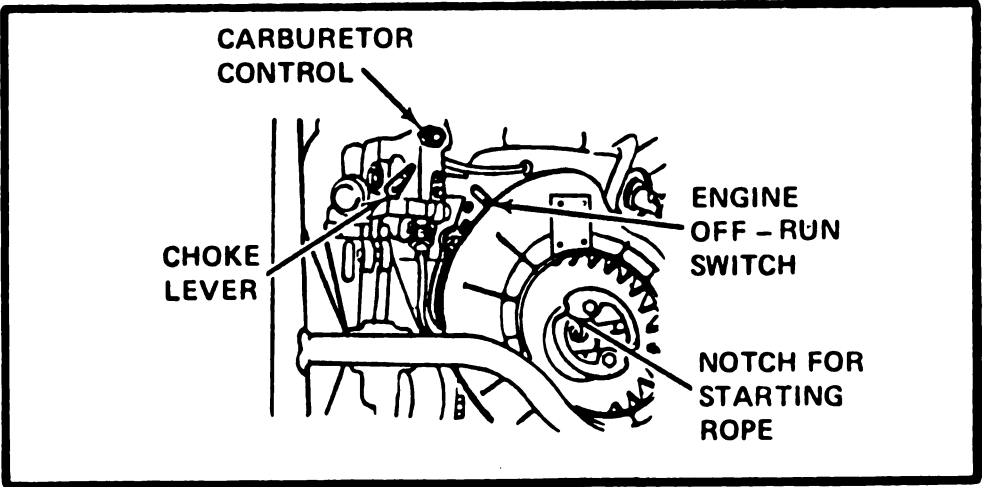
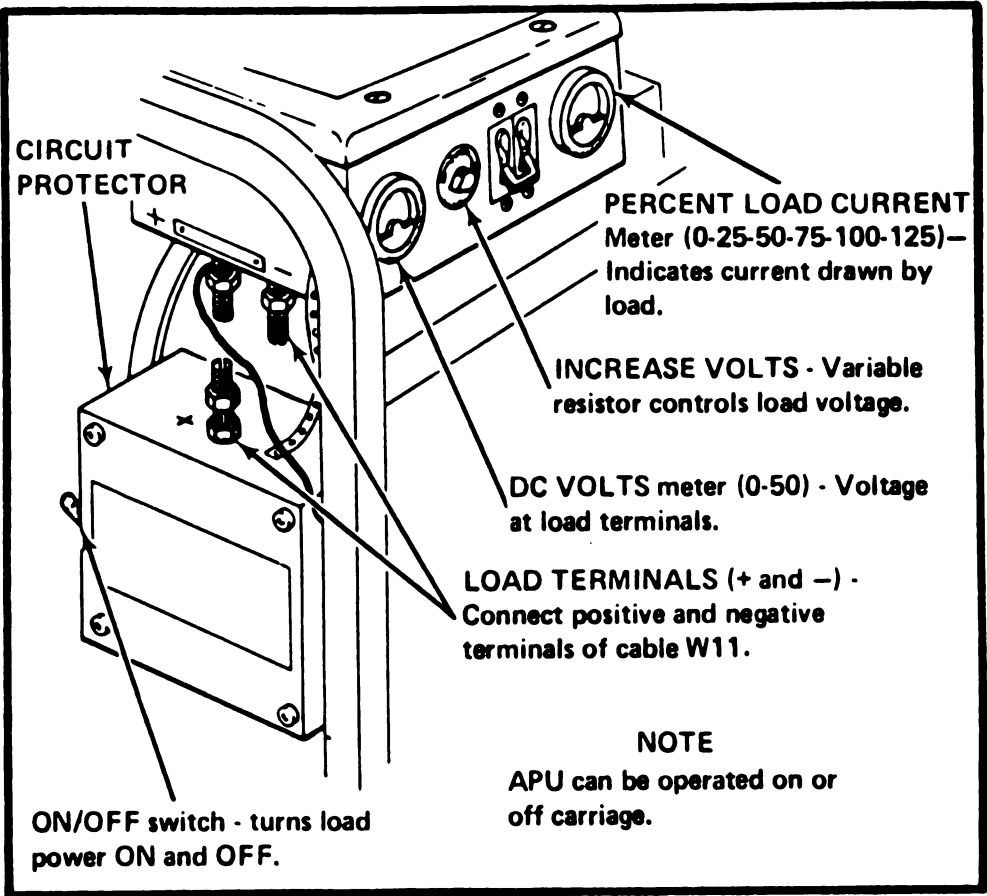
ARM/SAFE SWITCH AND LEAD



EXTERNAL RANGE CONTROL



AUXILIARY POWER UNIT (APU)



SECTION II .

OPERATION UNDER NORMAL CONDITIONS

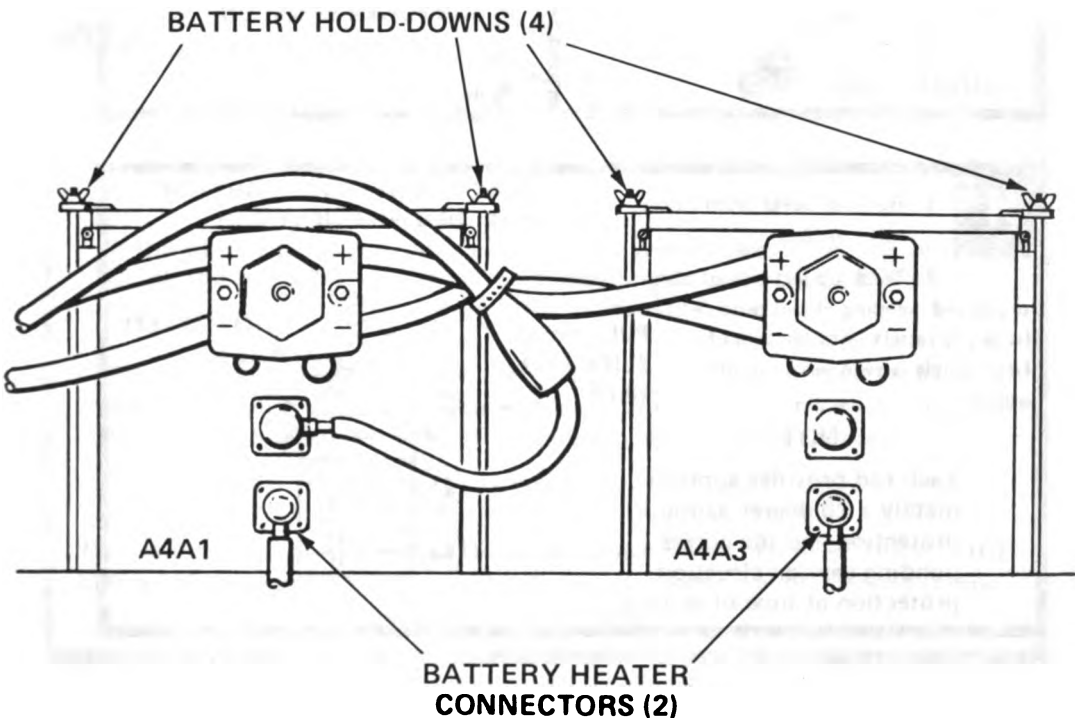
2-2 General. This section covers operation of the system under normal conditions. Operation under unusual conditions is described in section IV of this chapter.

2-3 Problems During Operation. Refer to chapter 3 section VII for troubleshooting procedures that will help isolate the cause of problems that may occur during operation. Section VII also contains recommended corrective actions.

2-4 Battery Taps. Make sure battery heater connectors and taps are connected as shown below.

IMPORTANT:

1. Make sure battery heaters are connected and battery hold-downs are tight.
2. Notify organizational maintenance to check batteries for position of battery taps.



FIRING INTERRUPTER

1

FIRING
INTERRUPTION
SWITCH

ON - interruption as
selected.

OFF - bypasses
interruption.

NO FIRE WHEN
LIT INDICATOR

ARMING
CONNECTOR

ARROW

SLIDE RODS

2

SYSTEM POWER
GUN POWER

MODE SWITCH

SIGHT LAMP

3

TO ADJUST THE
FIRING INTERRUPTER

SYSTEM POWER switch - OFF

LOW VOLTAGE switch - NORMAL

MODE switch - GRD

SIGHT - CAGED

SYSTEM POWER switch - ON

GUN POWER switch - ON

SIGHT LAMP INTENSITY - as
desired

4

1. Remove cover from firing
interrupter.

2. Track up left side of object to be
protected, keeping object outside
large site reticle until bottom of
large reticle is even with top of
object.

NOTE

Each rod provides approxi-
mately a 20 degree azimuth
protection and the corres-
ponding cannon elevation
protection at time of setting.

TRACK RIGHT UNTIL LIGHT GOES
OUT THEN PULL NEXT ROD.

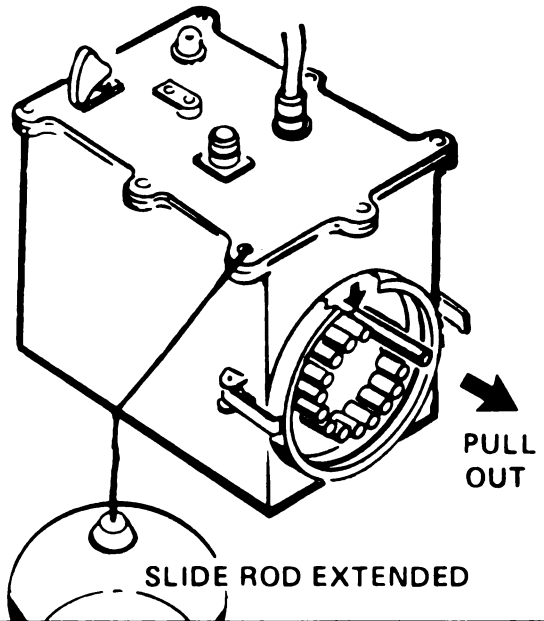
PULL FIRST
SLIDE ROD
HERE

PROTECTED
AREA

FIRING INTERRUPTER – Continued

5

3. Pull slide rod nearest the arrow, until **NO FIRE WHEN LIT** indicator lights. If two rods are equally near arrow pull both rods. This will provide approximately a 40 degree azimuth protection. Reposition mount if approximately a 20 degree area is desired.



6

**WARNING**

If the object to be protected is a mile or more away from the gun, block the sector in elevation, as the object may be hit by fire at high gun elevations or debris from air bursts.

4. Track along top of object to be protected until indicator light goes off. If fire interruption under reticle is still desired, pull out rod nearest to the arrow until light comes on. Repeat until sector or sectors to be protected are covered

SAFETY CHECK

Trace outline of object or objects to be protected with center of reticle. The **NO FIRE WHEN LIT** indicator light should stay on during tracing object outline or when center of reticle is passed into any portion of protected area.

END

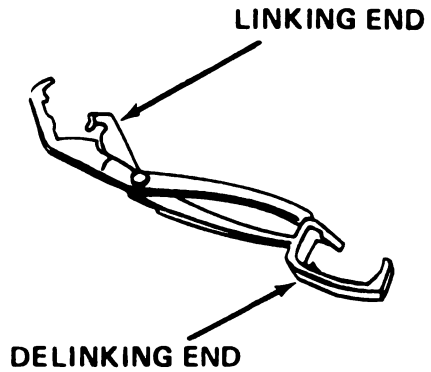
LINKER-DELINKER OPERATION



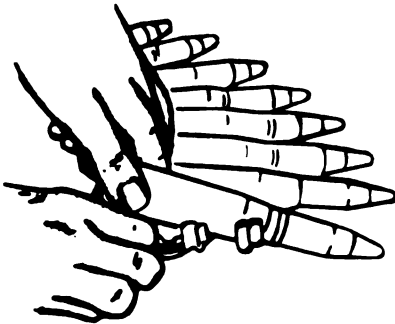
WARNING



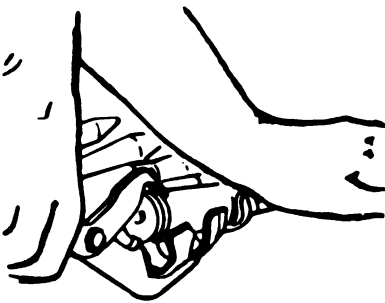
Electrically primed ammunition can fire if exposed to high-power radio frequency fields. Avoid contact of any kind with primer, especially with metal objects. See TM 9-1300-200 for ammunition handling instructions. Re-chambering of live ammunition is prohibited.



LINKING

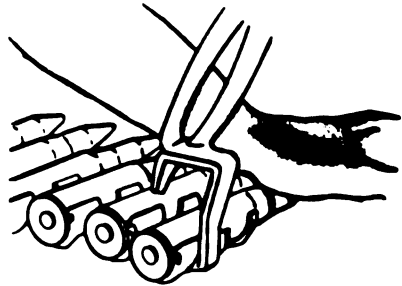


- Insert round in link.



- Clamp round into link. Make sure link tabs engage extractor groove.

DELINKING



- Insert tip of tool between round and link flange.



- Pull tool down to release round

LOADING THE 500 ROUND AMMUNITION STORAGE UNIT

1

OPEN –

Top covers, rear door and bellmouth door.

REMOVE –

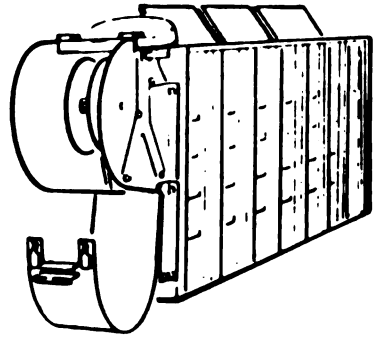
Feed chute cover.

LOADING –

- a. Set BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE.

Rotate cannon two (2) revolutions to clear cannon. Check exit chutes to make sure they are clear.

- b. Set BRAKE-CLEAR AND BRAKE switch to BRAKE to time cannon. Do not hold switch over 10 seconds in a one minute period. Make sure timing pin is released.



- c. Elevate cannon to between 5 and 10 degrees to facilitate loading.
 d. Make sure that GUN and SYSTEM POWER is OFF, firing contact assembly disconnected and arming connector removed.

2

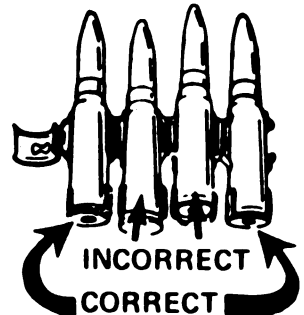
WARNING

Electrically primed ammunition can fire if exposed to high-power radio frequency fields. Avoid contact of any kind with primer, especially with metal objects. See TM 9-1300-200 for ammunition handling instructions. Rechambering of live ammunition is prohibited.



IMPORTANT – Make sure to use ground cover when ammunition is strung outside vehicle.

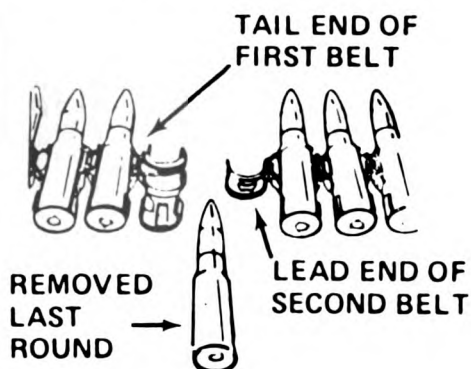
- ▲ Check that all rounds in belts are correctly linked. After all rounds are checked for correct linking, lay out ammunition belts so that open side of links are up.



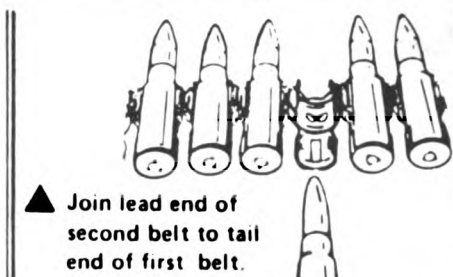
LOADING THE 500 ROUND AMMUNITION STORAGE UNIT – Continued

3

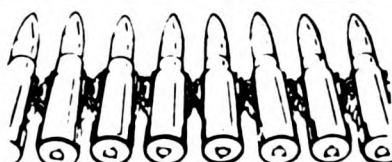
▲ Splice ammunition belts.



▲ With M25 delinker, remove last round from end of first belt (page 2-26).



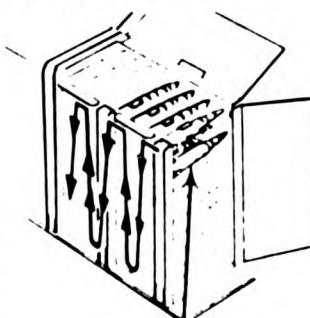
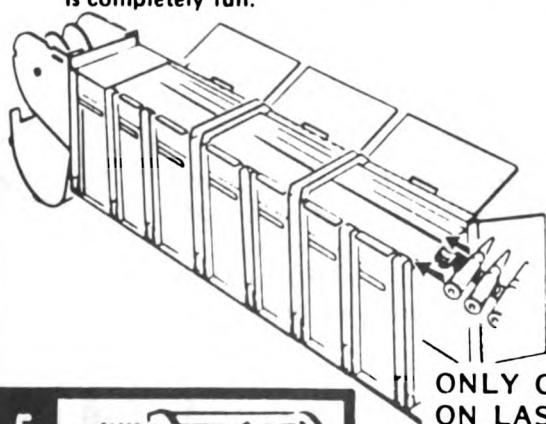
▲ Join lead end of second belt to tail end of first belt.



▲ With M25 linker clamp round in link (page 2-26).

4

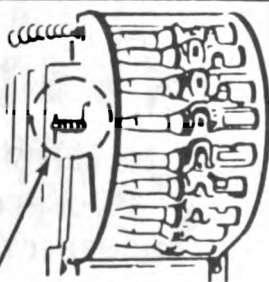
Load ammunition, links down, single link first. Suspend in loops from support rails. Load 1 link and 8 rounds hanging, 2 rounds on top of rail followed by loops of 24 each. Push loops forward until the ammunition storage unit (ASU) is completely full.



CAUTION

ONLY ONE ROUND BELOW RAILS ON LAST STRING AS SHOWN.

5



Pull ammunition out of ammo storage unit while holding the spring lever rotated.

LOCKING MECHANISM SPRING LEVER

LOADING THE 500 ROUND AMMUNITION STORAGE UNIT – Continued

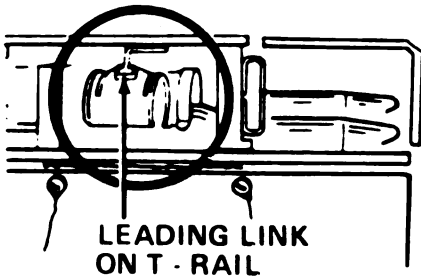
6

Pull ammo out of bellmouth and insert in chuting. Push toward feeder.

7**CAUTION**

Do not hold BRAKE-CLEAR AND BRAKE switch in the CLEAR AND BRAKE position longer than 10 seconds, during any one-minute interval.

Start ammo into feeder so links are on the T-rail stripper guide. Hold BRAKE-CLEAR and BRAKE switch to BRAKE. Strip 1 round by rotating the barrel cluster.

**8**

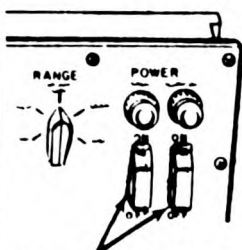
IMPORTANT: DO NOT release switch until barrel cluster has stopped rotating.

Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE – Rotate cannon barrels to clear cannon. Clear all exit chutes. Close and secure all doors, covers, and install feed chute cover. Connect fire contact assembly and install arming connector.

END

UNLOADING THE 500 ROUND AMMUNITION STORAGE UNIT

- 1 Make sure that GUN and SYSTEM POWER switches are OFF, firing contact assembly disconnected, and arming connector removed.

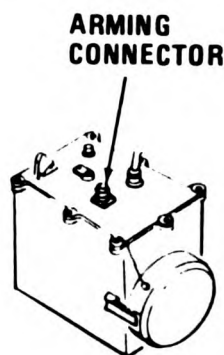


GUN and SYSTEM
POWER switches



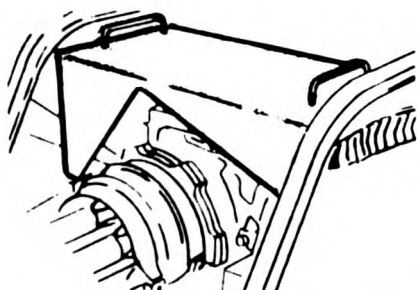
FIRING CONTACT ASSY

CONNECTOR



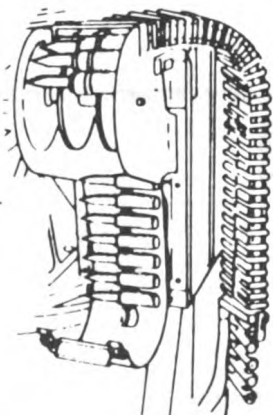
ARMING
CONNECTOR

- 2 Remove gun shield, elevate cannon to between 5 and 10 degrees to facilitate unloading.



Remove the feed chute cover, disconnect the feed chute at the feeder, and separate the ammunition belt. Reinsert round in empty link.

- 4 Open bellmouth door, separate ammunition belt, and pull ammunition through feed chute. Reinsert round in empty link.

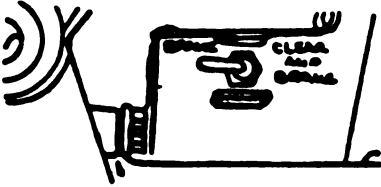
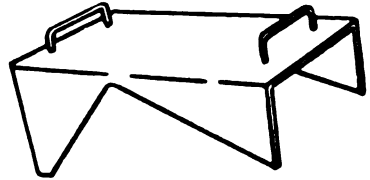


Connect feed chute to the feeder and reinstall chuting cover.

UNLOADING THE 500 ROUND AMMUNITION STORAGE UNIT – Continued

6

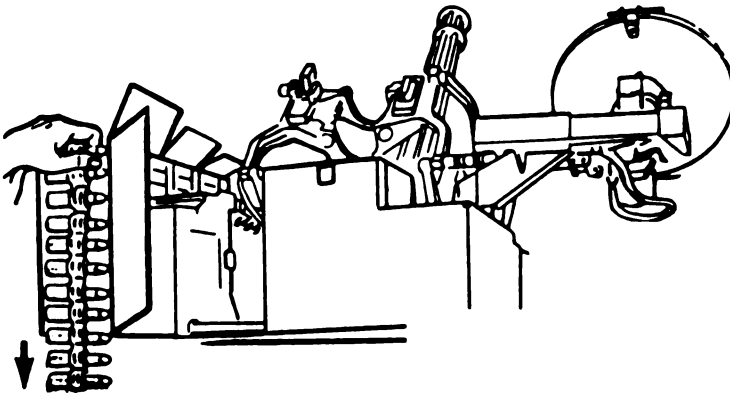
Hold BRAKE—CLEAR AND BRAKE switch to BRAKE and rotate the barrel cluster to clear the cannon and feeder. Clear exit chute of all rounds.

**7**

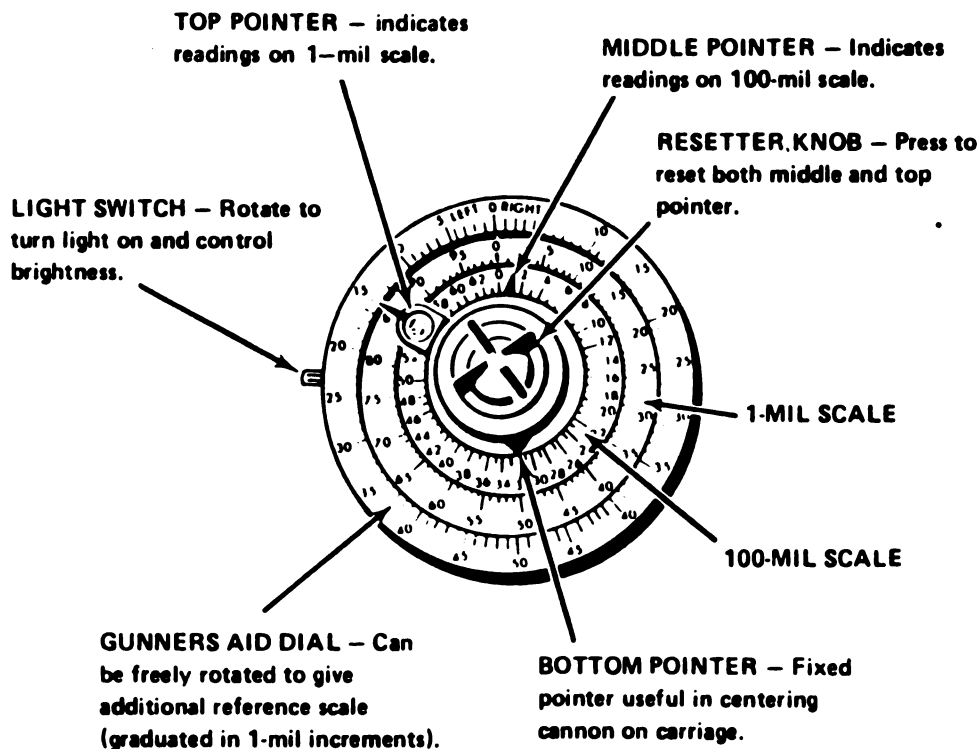
Install gun shield.

8

Place a ground cover to the rear and under the ammunition storage unit. Open top doors, rear door, and remove ammunition through the rear of the ammunition storage unit. Rotate locking lever on bellmouth if ammunition loop is held by the forward lock. Close and secure all storage unit doors and bellmouth door.

**END**

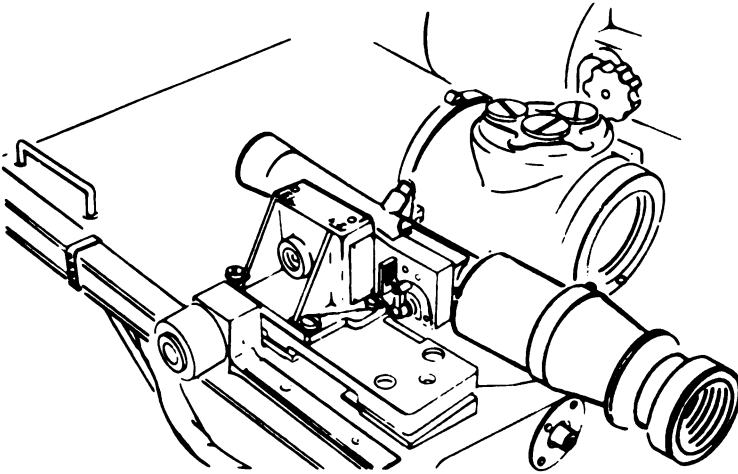
AZIMUTH INDICATOR



The azimuth indicator is normally used to lay indirect fire during the ground mode. Zero the top and middle pointers on the azimuth of the firing, or reference point. Make corrections by training the cannon as directed while observing the indicator.

The azimuth indicator can be used for any purpose that requires an accurate indication of cannon position in relation to a preset azimuth reference point.

M134 TELESCOPE AND M164 MOUNT

**INSTALLATION**

1. Check that mount is clean where the telescope attaches.

2. Loosen clamp screws.

3. Raise lock lever to up position.

4. Align scope and mount and push scope forward to stop. Move lock lever to down position.

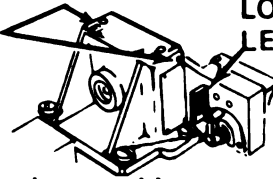
5. Remove lens cover (pull off).

6. Align gun by training the M61A1 sight at a distant aiming point.

LENS COVER

CLAMP
SCREWS

LOCK
LEVER



7. Adjust azimuth and elevation screws to align telescope on distant aiming point. Tighten clamp screws and install lens cover (push on).

8. Boresight according to page 3-74.

**REMOVAL****CAUTION**

Make certain that both telescope and case are completely dry before storing telescope in case.

1. Raise lock lever.

2. Slide telescope rearward off mount.

3. Check that lens cover is installed and store telescope in case.

HYDRAULIC SYSTEM

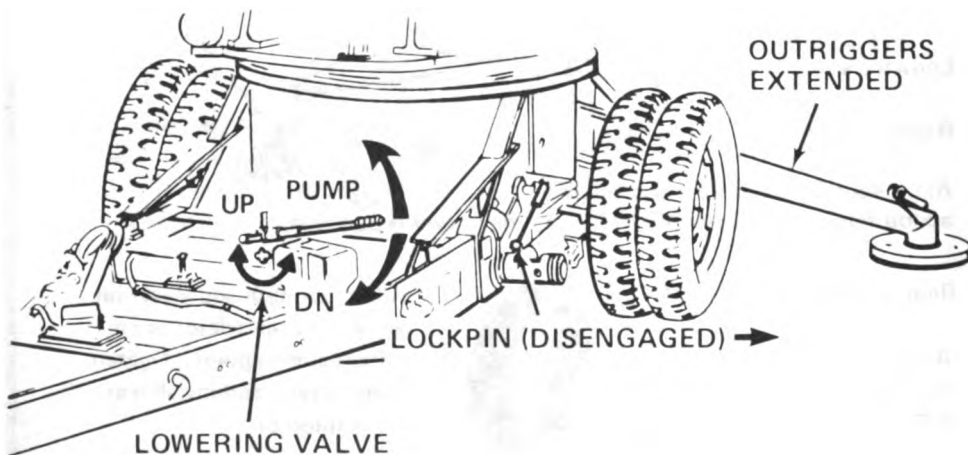
TO RAISE CARRIAGE AND STOW OUTRIGGERS

- VALVE - Rotate to UP and prime pump with handle in stow position.
- PUMP HANDLE - Extend and pump until lockpins can be engaged.
- LOCKPINS - Engage and stow handles under holdowns.
- OUTRIGGERS - Stow and lock.
- VALVE - Open after lockpins are engaged.
- DROP PAD - Down and locked until after prime mover is connected.
- BRAKES - Unlocked.



WARNING

Before lowering carriage, make certain personnel are clear and outriggers and front drop pad will set on firm terrain.

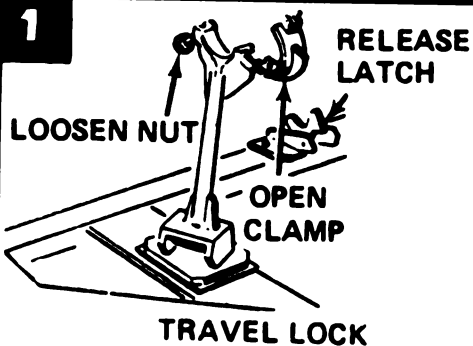


TO EXTEND OUTRIGGERS AND TO LOWER CARRIAGE

- BRAKES - Locked.
- DROP PAD - Down and locked (before disconnecting from prime mover).
- OUTRIGGERS - Extend and lock.
- VALVE - Rotate to UP and prime pump with handle in stow position.
- PUMP HANDLE - Extend and pump until both lockpins can be disengaged.
- LOCKPINS - Disengage.
- VALVE - Rotate to DN.

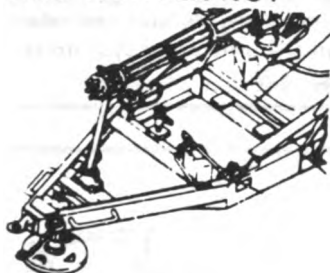
PREPARATION FOR TOWING AND TRAVEL

1



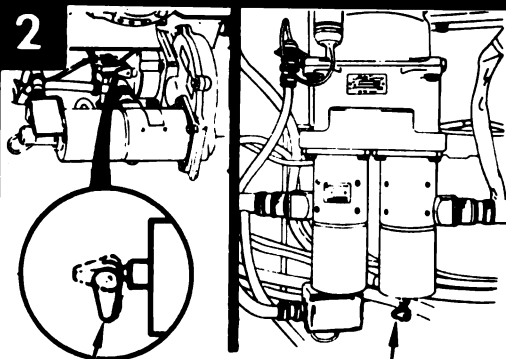
3

PLACE BARRELS IN CLAMP AND TIGHTEN NUT



REAPPLY ELEVATION AND AZIMUTH DRIVE BRAKES

2



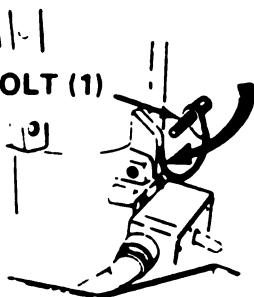
Release azimuth and elevation brakes.

4

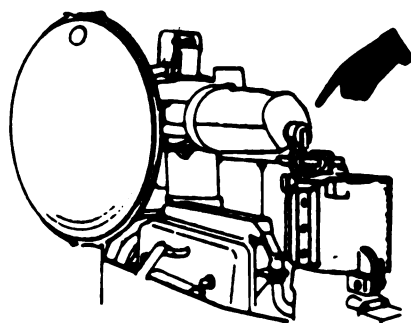
ANTENNA MOUNT

STOW POSITION

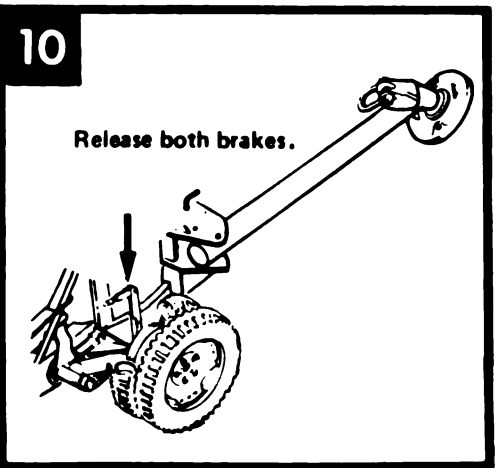
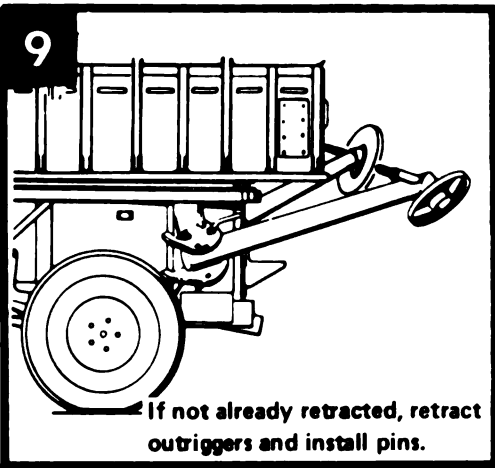
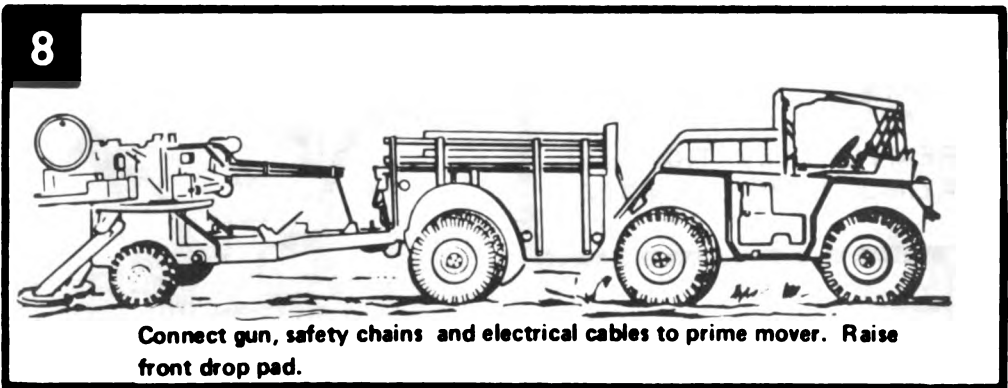
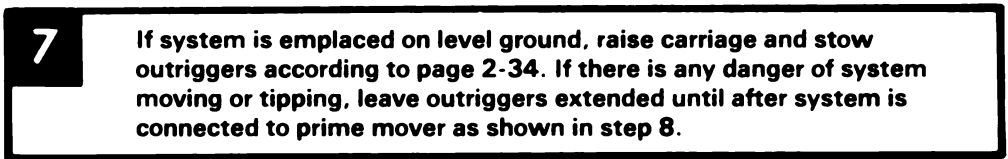
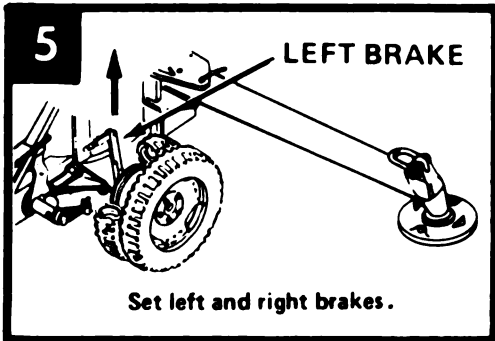
BOLT (1)



Remove bolt (1) and manually rotate antenna base to the stop. Lock into position with bolt (1)



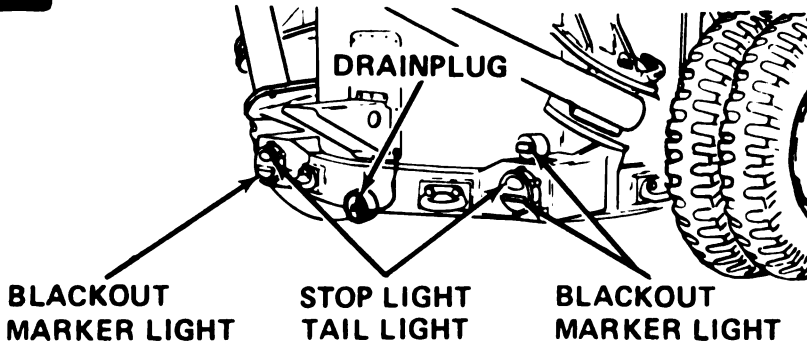
PREPARATION FOR TOWING AND TRAVEL – Continued



PREPARATION FOR TOWING AND TRAVEL – Continued

11

INSTALL DRAINPLUG AND CHECK RUNNING LIGHTS



12

CAUTION

Wait 30 minutes after firing cannon to install gun mount cover.



Install gun mount cover.

13



Check that safety chains, and electrical cables are connected to prime mover. Front drop pad up and locked.

END

PREPARATION FOR TOWING AND TRAVEL – Continued

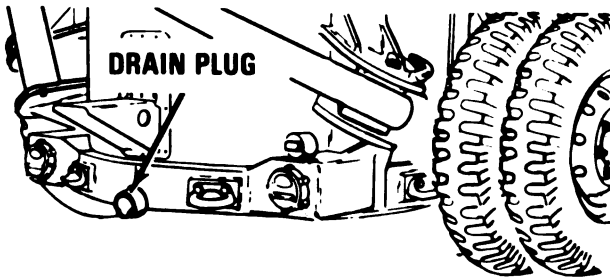
FORDING PROCEDURES

2-5 General. For the purposes of this manual, fording operations are divided into two classes: shallow fording and deep fording. Shallow fording is towing the weapon through water of such depth that no preparation of equipment is necessary to prevent water damage. Deep fording is towing the weapon through water of such depth that the equipment must be prepared to prevent water damage.

BEFORE FORDING

NOTE

Be sure drain plug is installed in bottom of carriage before fording.



Remove APU and telephone from the gun carriage and stow them in the prime mover for deep fording.

CAUTION

Don't go faster than two or three miles per hour (walking speed) when fording.

NOTE

Detailed procedures for fording and swimming the prime mover (M561) are located in TM 9-2350-242-10.

PREPARATION FOR TOWING AND TRAVEL — Continued

MAXIMUM FORDING DEPTHS

Shallow fording includes water depths up to 17 inches. Deep fording includes water depths from 17 to approximately 37 inches with APU removed.

Movement of the water against the upstream side of the weapon will cause the water to build up on that side. Two or three inch allowance should be made for this effect, depending on stream velocity.

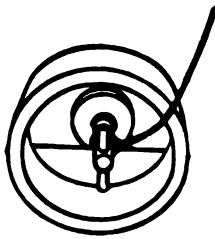
Movement of the weapon through the water will cause a build up of water against the front of the weapon, and the prime mover wheels and weapon carriage frame will cause turbulence and waves. Towing at very low speed will reduce this effect.

A rough stream bottom will cause the prime mover and towed weapon to bounce and make waves that may raise the water above the maximum allowable depth. A soft bottom may allow the weapon wheels to sink in causing the effective water depth to raise above that allowable maximum.

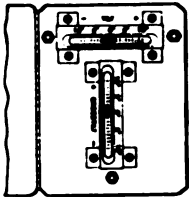
AFTER FORDING

Remount APU and telephone on gun carriage.

Inspect weapon. Remove drain plug in bottom of carriage to allow trapped water to drain. Reinstall drain plug.



GUN EMPLACEMENT



- 1 Select level area (10° max as indicated on INCLINOMETER) and emplace gun

CAUTION

Do not emplace gun on hard surfaces, such as rock or concrete. Gun will slide when fired.

- 9 MUZZLE CLAMP - installed

- 4 HAND BRAKES (2) locked

- 10 ANTENNA - unstowed

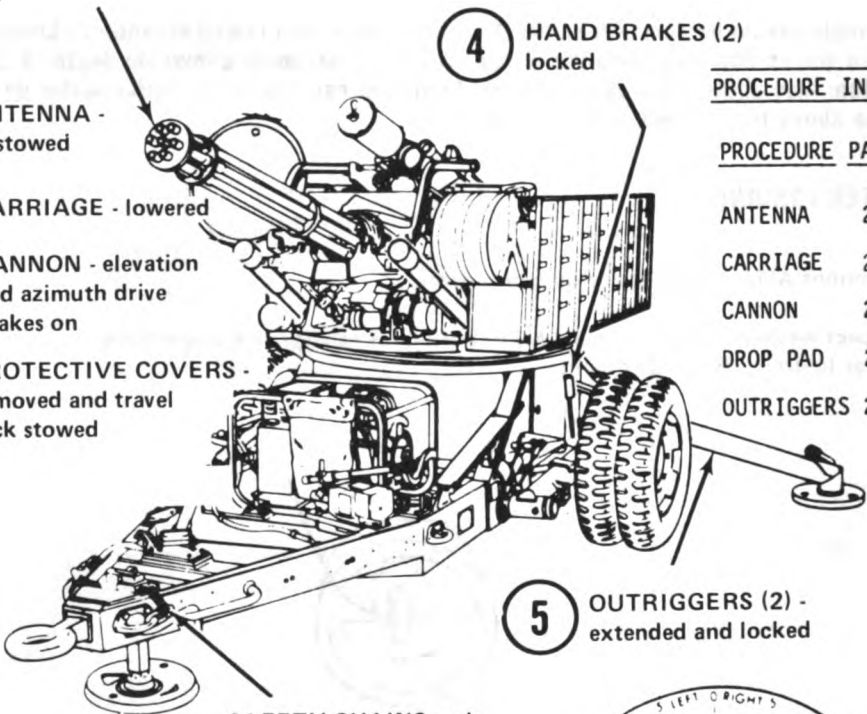
- 6 CARRIAGE - lowered

- 8 CANNON - elevation and azimuth drive brakes on

- 7 PROTECTIVE COVERS - removed and travel lock stowed

PROCEDURE INDEX

PROCEDURE	PAGE
ANTENNA	2-35
CARRIAGE	2-19
CANNON	2-14
DROP PAD	2-20
OUTRIGGERS	2-34



- 5 OUTRIGGERS (2) - extended and locked

- 2 SAFETY CHAINS and ELECTRICAL CABLES - stowed in racks

- 3 DROP PAD - down and locked

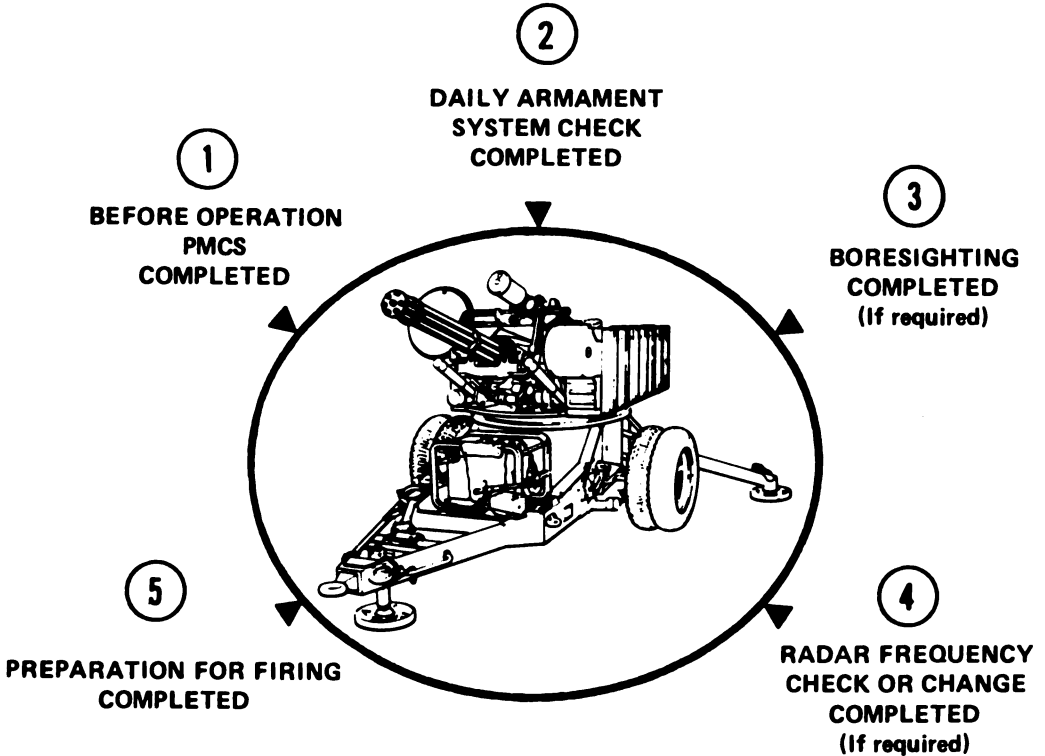
- 11 AZIMUTH INDICATOR - set as required by tactical situation



END

PREPARATION FOR FIRING

2-6 General. Perform or verify that all prefire preparations have been completed before firing. **IMPORTANT:** If you expect to fire on the move, or if you anticipate an attack while traveling, keep the system in a condition that allows immediate response. The system should be completely energized and the cannon free to traverse and elevate. **BEFORE** starting such a move and before firing, the following prefire preparations **MUST** be performed or verified in the sequence given:



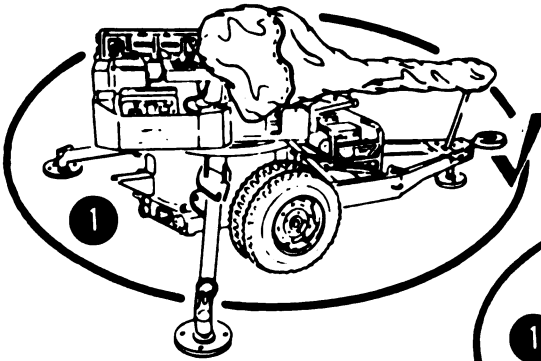
PROCEDURE INDEX

<u>PROCEDURE</u>	<u>PAGE</u>
BEFORE OPERATION PMCS	3-3
BORESIGHTING	3-74
DAILY ARMAMENT SYSTEM CHECK	3-23
RADAR FREQUENCY CHANGE	3-104

PREPARATION FOR FIRING – Continued

PROTECTIVE COVERS

Remove and stow



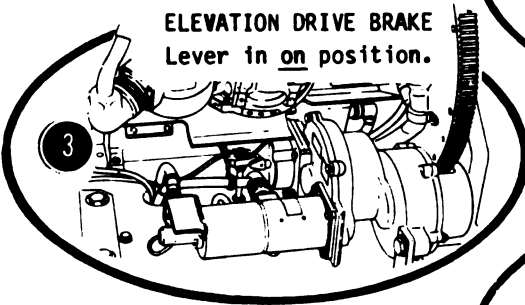
BARREL CLUSTER

Unclamp from travel lock. Lay travel lock back and secure with quick-release latch. Gun DRIVE MOTOR BRAKE levers in on position.

1

ELEVATION DRIVE BRAKE

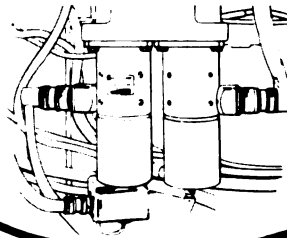
Lever in on position.



AZIMUTH DRIVE MOTOR BRAKE

Lever in on position.

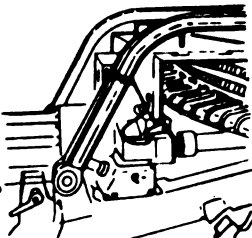
1



GUN SHIELD

Secure - with rear latches engaged and two quick-release pins installed.

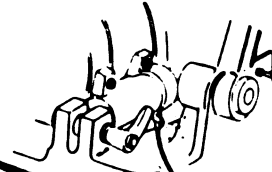
3



RECOIL ADAPTERS

Quick release pins installed.

6



AUXILIARY POWER UNIT (APU)

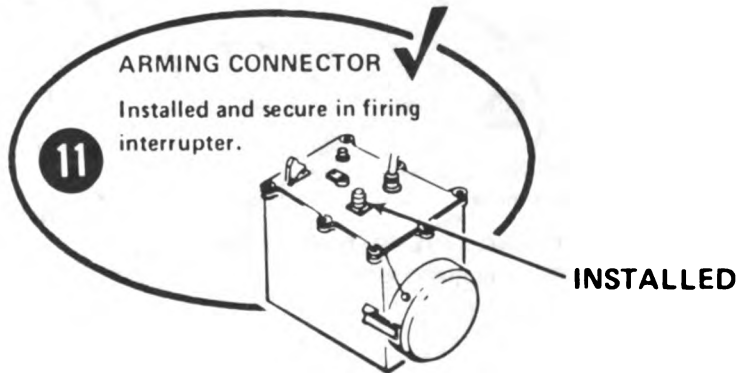
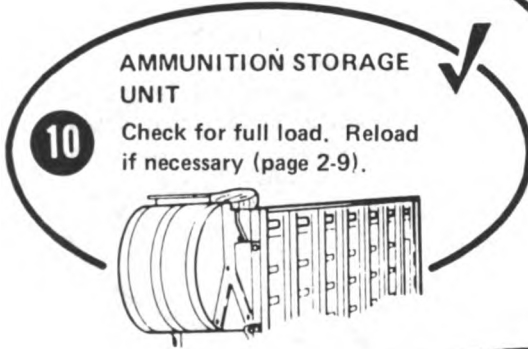
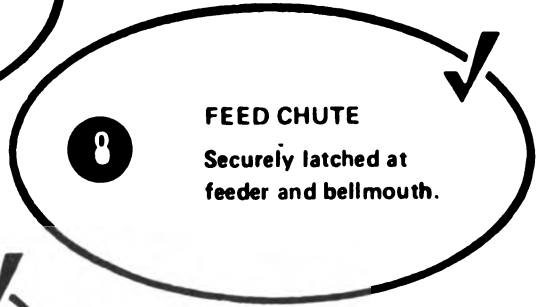
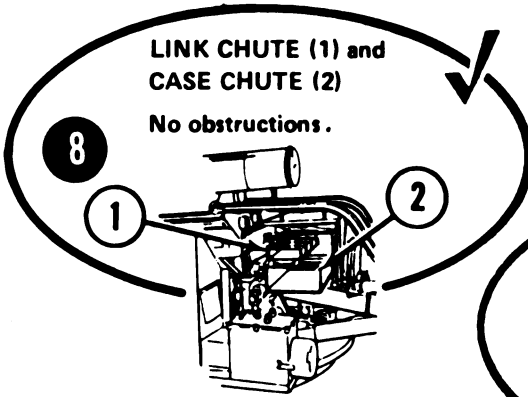
Start and adjust to keep batteries charged (page 2-94).

1

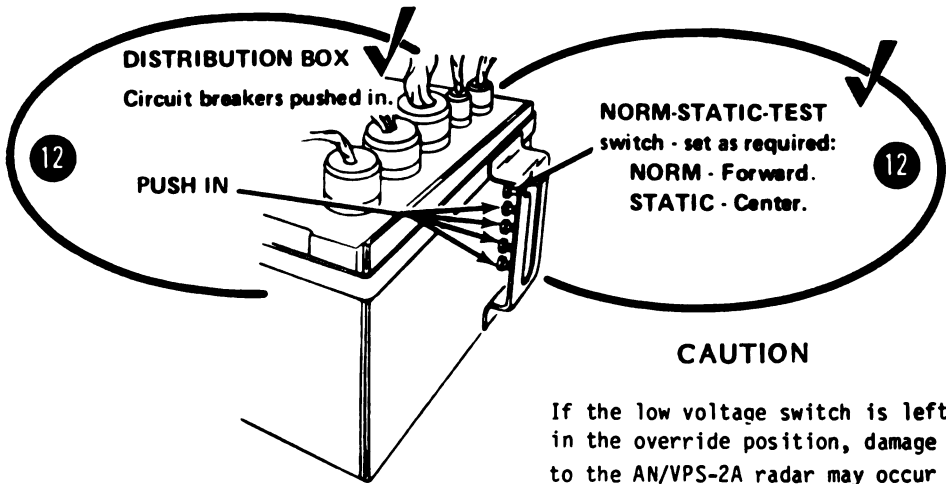
PREPARATION FOR FIRING – Continued

CAUTION

Make sure that proper end of link chute (1) is connected to feeder.

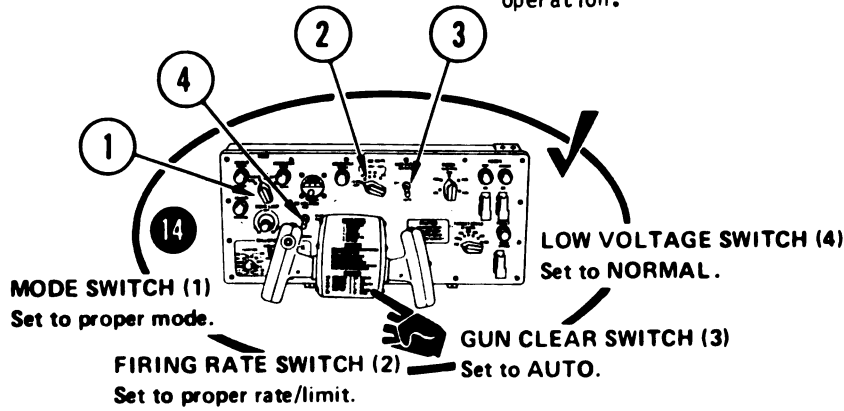


PREPARATION FOR FIRING – Continued



CAUTION

If the low voltage switch is left in the override position, damage to the AN/VPS-2A radar may occur during subsequent system operation.



PREPARATION FOR FIRING – Continued

ANTENNA ELECTRICAL UNSTOWING

CAUTION

Never rotate antenna by hand. If you force the antenna gearing without electrically releasing the brake, the brake may be damaged.

RECHECK SWITCHES
Control Assembly

12

MODE switch - RADAR
 LOW VOLTAGE switch - NORMAL
 SYSTEM POWER switch - ON

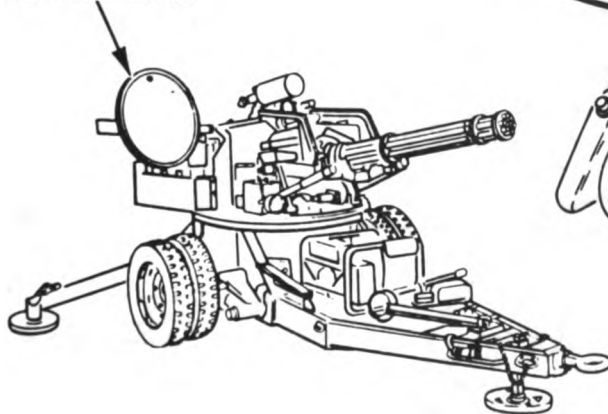
SIGHT - UNCAGED
Stow Control

MODE switch - NORMAL
 MAINT switch - OFF

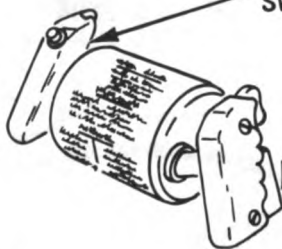
16

Press ACQ/TRK pushbutton and either action switch. The antenna repositions on cannon axis. Release ACQ/TRK pushbutton and action switch.

ANTENNA
OUT OF STOW



ACTION
SWITCHES

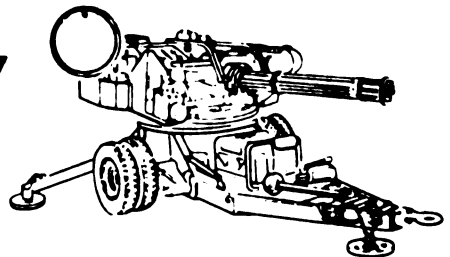
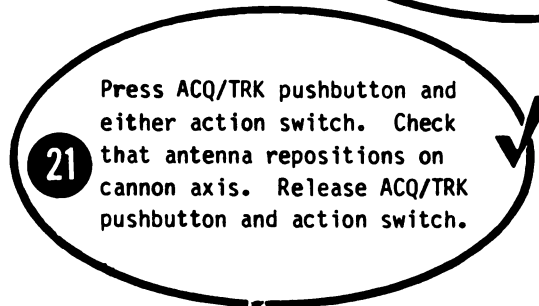
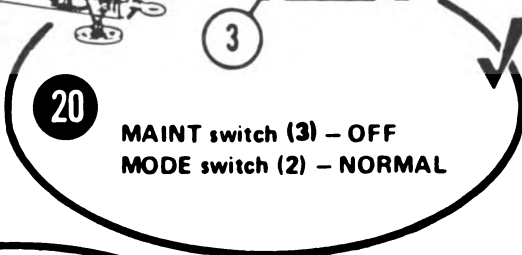
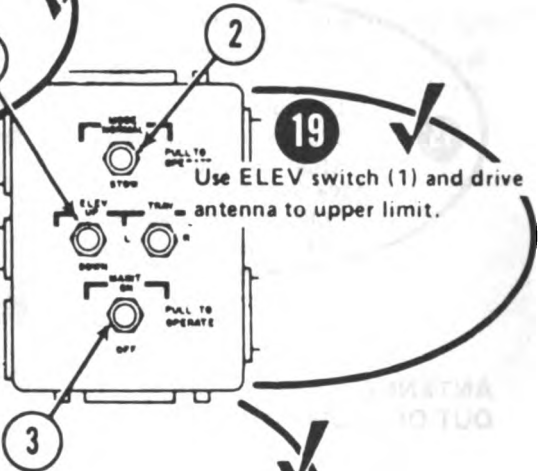
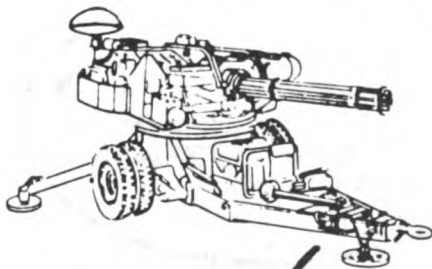
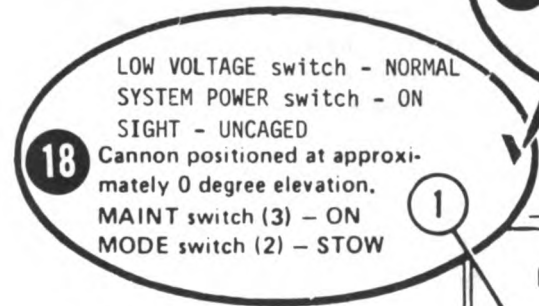
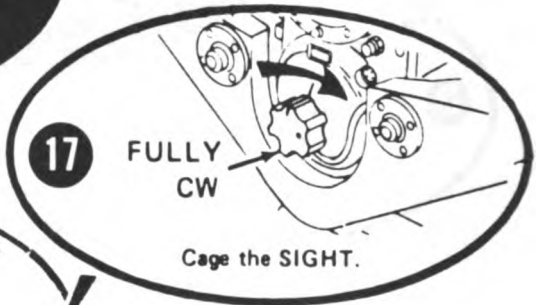


Change 4

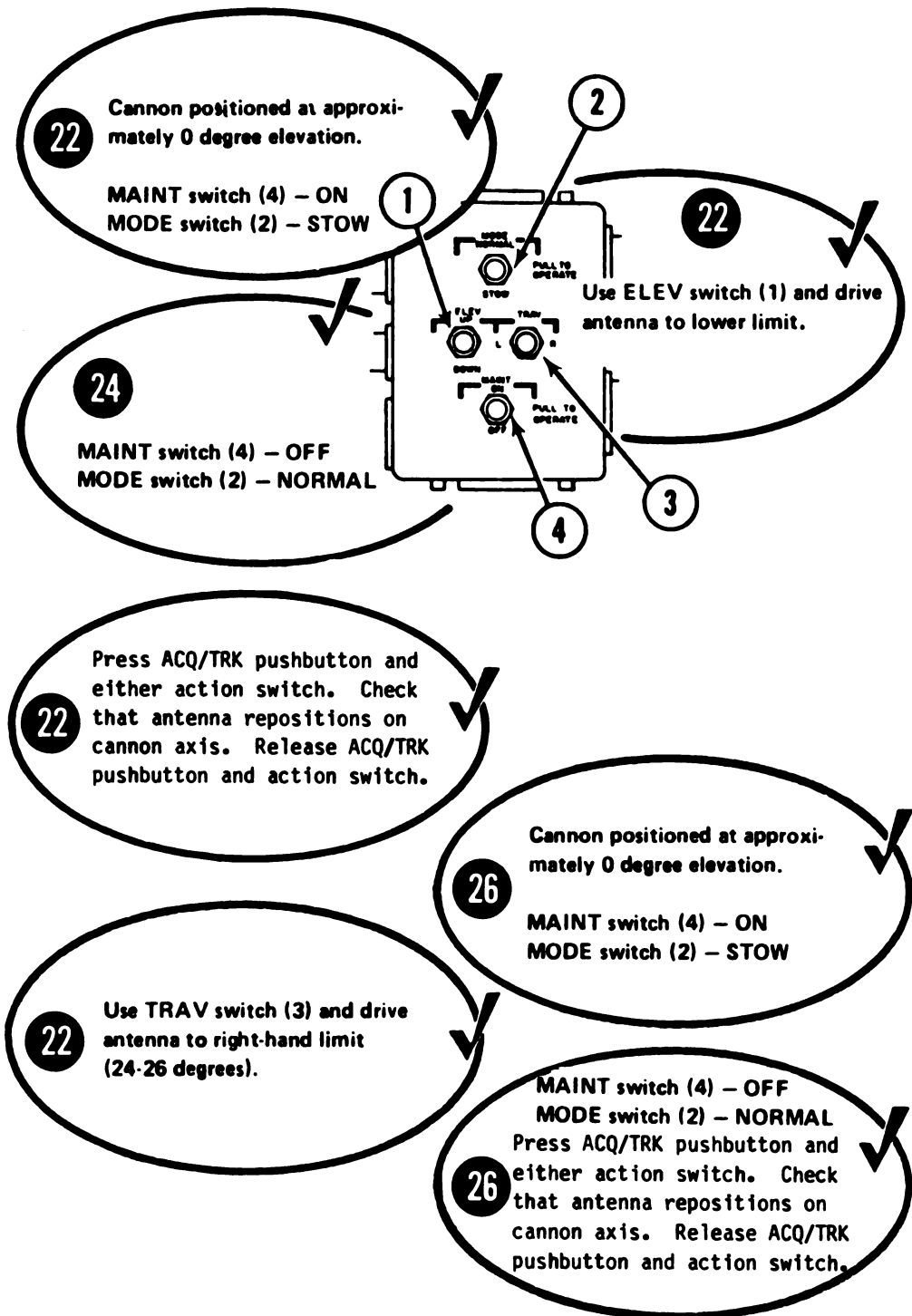
2-45

PREPARATION FOR FIRING – Continued

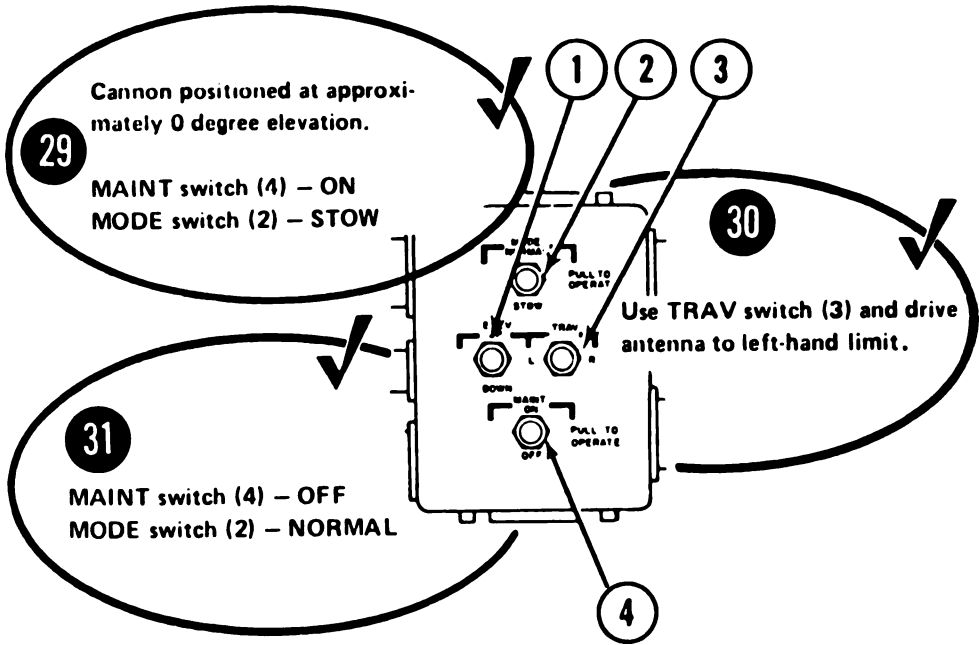
ANTENNA SERVO DRIVE CHECK



PREPARATION FOR FIRING – Continued



PREPARATION FOR FIRING – Continued

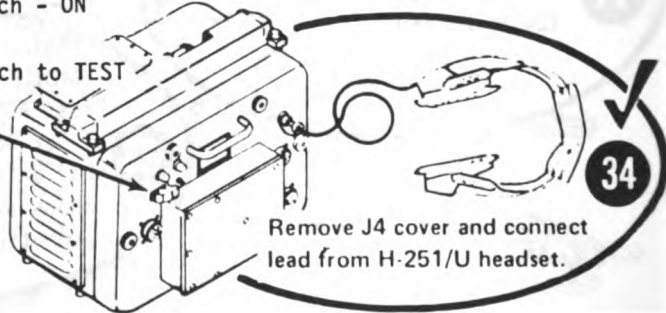


32 Press ACQ/TRK pushbutton and either action switch. Check that antenna repositions on cannon axis. Release ACQ/TRK pushbutton and action switch.

CLUTTER LOCKON TEST

33 RECHECK SWITCHES
Control Assembly
MODE switch - RADAR
LOW VOLTAGE switch - NORMAL
SYSTEM POWER switch - ON
SIGHT - UNCAGED

Set CLUTTER-LOCKON switch to TEST



PREPARATION FOR FIRING – Continued

**WARNING**

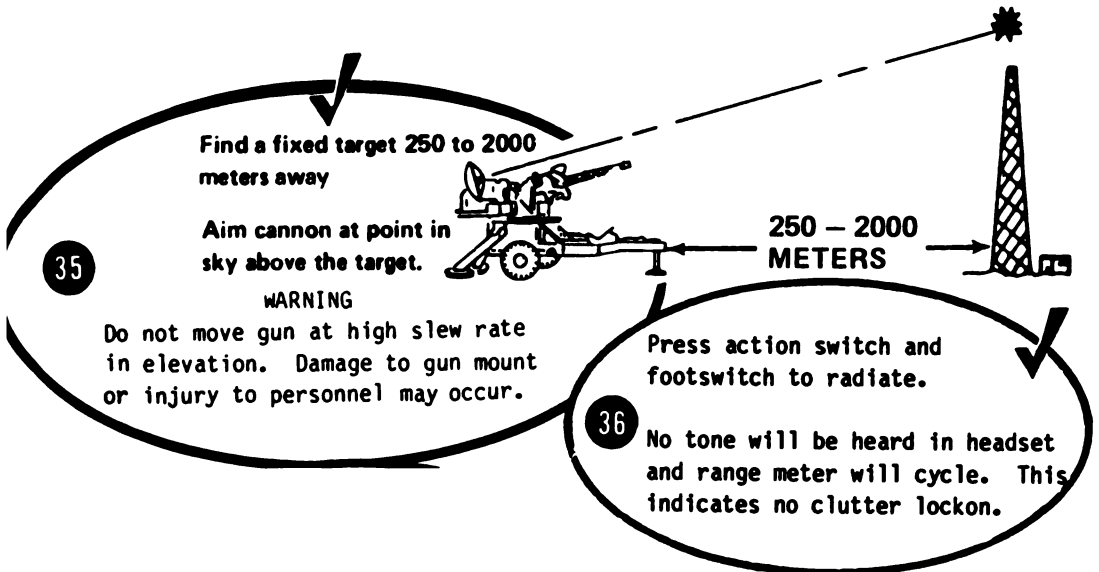
Radar emissions are hazardous within three feet of the antenna.



While operating in the RADAR, MANUAL, EXTERNAL or the TEST MODES, do not attempt to command the cannon in elevation after it has reached maximum elevation (contacted the mechanical stop). The turret will rotate unexpectedly at an uncontrolled rate until the action switches are released.

CAUTION

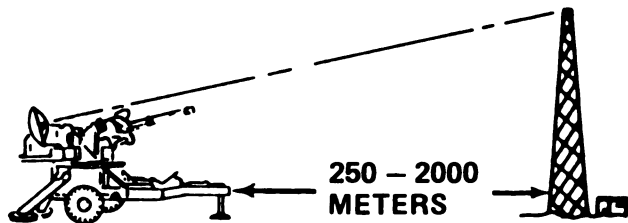
Do not radiate at targets closer than 250 meters. This will damage the radar receiver (unit 3).



PREPARATION FOR FIRING – Continued

✓
Acquire target in sight reticle.

- 37 A tone will be heard and range meter will indicate target range, and the sight READY-TO-FIRE indicator lights.



- 38 Elevate cannon to original position. ✓

Tone stops and range meter cycles when target disappears from sight reticle.

✓
Release footswitch and action switch.

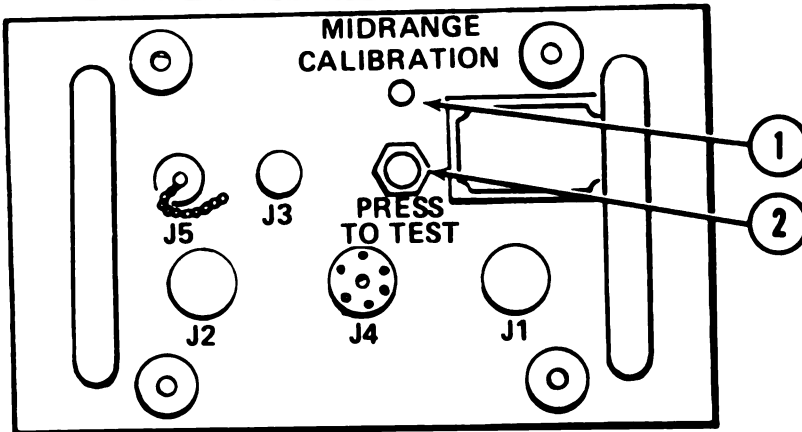
- 39 Set receiver-transmitter CLUTTER LOCKON switch to NORMAL.

PREPARATION FOR FIRING – Continued

MIDRANGE CALIBRATION CHECK

NOTE

The MIDRANGE CALIBRATION indicator (1) in the off state is dimly lit and flashing about once per second. In the on state, the indicator stays brightly lit.



RANGE COMPUTER

NOTE

Push in PRESS TO TEST switch (2) and hold.

40

MIDRANGE CALIBRATION indicator (1) lights brightly within two seconds. See NOTE.

If MIDRANGE CALIBRATION indicator (1) does not light or, after switch has been released, stays bright only momentarily – notify organizational maintenance.

Release PRESS TO TEST switch (2) – note that MIDRANGE CALIBRATION indicator stays lit for not more than three seconds, then resumes blinking. See NOTE.

41

42

Enter ballistics values.

PREPARATION FOR FIRING – Continued

BALLISTICS VALUES

2-7 Introduction. For accurate firing, accurate ballistics values should be entered into the fire control system through the control panel BALLISTICS/BIT subpanel. Muzzle velocity, air density, ammo type, wind speed and direction, and tilt and cross tilt all affect the ballistics solution computed by the fire control processor.

NOTE

BALLISTICS/BIT FUNCTION switch
positions OFF, LT, SP, and ZO are not
used for ballistics entry.

Enter the latest BALLISTICS VALUES on the BALLISTICS/BIT subpanel before firing. After the ballistics values have been entered and the SYSTEM POWER is turned OFF and then turned back ON, the ballistics values previously entered will be stored and displayed. The system can fire using the stored values, but accuracy may be affected. For the best target engagement, always enter the most current ballistics VALUES and update these values as local conditions change.

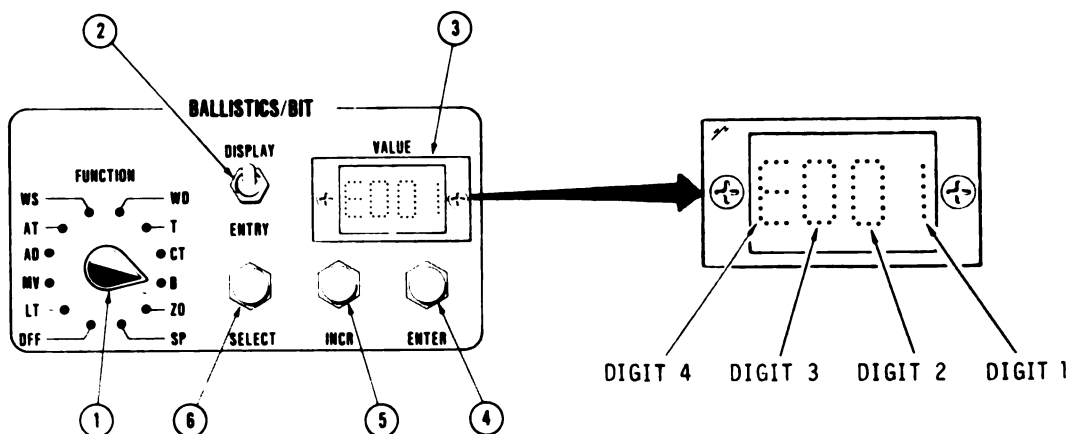
Table 2-1 shows the maximum and minimum values for each function. Any value entered that is above maximum or below minimum will cause the fire control system to automatically enter the maximum or minimum value.

Table 2-1. Ballistics Values

FUNCTION	MANUAL ENTRY VALUES	
	MINIMUM	MAXIMUM
MV - MUZZLE VELOCITY	3	9
AD - AIR DENSITY	6 0	1 3 0
AT - AMMO TYPE	1	5
WS - WIND SPEED (KNOTS)	0	4 0
WD - WIND DIRECTION (MILS)	0	6 3 9 9
T - TILT (Degrees)	- 1 0	1 0
CT - CROSS TILT(Degrees)	- 1 0	1 0

PREPARATION FOR FIRING – Continued

BALLISTICS VALUES – Continued

General Procedure.**NOTE**

Insure MODE switch is set to RADAR or MAN.

1. Set the FUNCTION switch (1) to the desired BALLISTICS function. The VALUE display (3) shows the currently entered ballistics value. Decimals are not shown on the display and should be ignored when entering a value containing a decimal.
2. Set the DISPLAY/ENTRY switch (2) to ENTRY. DIGIT 1 flashes, indicating that it is ready to be updated.
3. Press and release the INCR pushbutton (5) to increase the flashing digit by one number. Continue to press and release the INCR pushbutton until the desired number is displayed. (DIGITS 1 through 3 increase from 0 to 9.)
4. If the ballistics value being updated has more than one digit, press and release the SELECT pushbutton (6) to select DIGIT 2 for updating, then press and release the INCR pushbutton (5) to increase the digit by one. Repeat for DIGITS 3 and 4 if required. Pressing SELECT after DIGIT 4 has been updated will start the cycle again at DIGIT 1. DIGIT 4 sequences through =, -, A, C, E, F, U, then from 0 to 9. The = symbol indicates a blank which represents a + symbol in DIGIT 4.

NOTE

DO NOT change the FUNCTIONS switch (1) or DISPLAY/ENTRY switch (2) settings before using the ENTER pushbutton (4). This will erase the VALUE just entered and the ballistics value will return to its stored value.

5. When the VALUE display indicates the desired ballistics value, enter the VALUE shown by pressing and releasing the ENTER pushbutton (4).

PREPARATION FOR FIRING – Continued

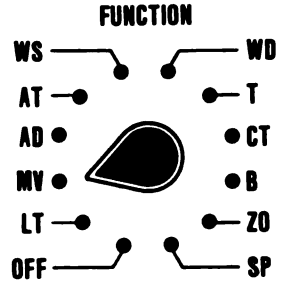
BALLISTICS VALUES – Continued

MV - Muzzle Velocity.

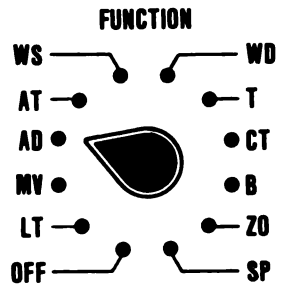
NOTE

The MUZZLE VELOCITY and AIR DENSITY charts for M246, M220, and PATEC ammo are shown in tables 2-2 through 2-4. The M246 chart is also located on the ammunition storage unit.

1. Set the FUNCTION switch to the MV position.
2. Set the DISPLAY/ENTRY switch to ENTRY.
3. Determine the local temperature in degrees fahrenheit (°F).
4. Check the system log book for the total rounds fired on the barrel cluster.
5. Determine the AMMO TYPE you are to use. Refer to the appropriate chart.
6. Using the correct BARREL CLUSTER ROUNDS FIRED column (0 - 36 or 36 - 72) and the TEMPERATURE column (use the TEMPERATURE column closest in value to the local temperature), locate the MUZZLE VELOCITY VALUE.
7. Update and enter the MUZZLE VELOCITY VALUE in DIGIT 1 of the VALUE display.

AD - Air Density.

1. Set the FUNCTION switch to the AD Position. Check that the DISPLAY/ENTRY switch is set to ENTRY.
2. Determine the local altitude in feet.
3. Refer to the AIR DENSITY portion of any of the muzzle velocity and air density charts. Using the local ALTITUDE column and the same TEMPERATURE column that was used for the MV setting, determine the 2 or 3 digit AIR DENSITY ballistics value.



NOTE

If a current (less than one hour old) air density value is available from local MET services, use that value instead of the chart value.

4. Update and enter the AIR DENSITY value. (DO NOT leave a space for the decimal place.)

PREPARATION FOR FIRING – Continued

BALLISTICS VALUES – Continued

Table 2-2. M246 Ammo Muzzle Velocity Value Chart

AIR DENSITY											TEMPERATURE IN DEGREES FAHRENHEIT	MUZZLE VELOCITY VALUES	
.95	.95	1.00	1.05	1.05	1.10	1.15	1.20	-	-	-	-70	8	9
.90	.90	.95	1.00	1.00	1.05	1.10	1.15	1.20	1.20	-	-50	8	9
.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	1.15	1.20	-30	7	8
.80	.80	.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	0	7	8
.75	.75	.80	.80	.85	.90	.90	.95	1.00	1.00	1.05	30	6	7
.70	.70	.75	.75	.80	.80	.85	.90	.90	.95	1.00	70	5	6
-	-	.70	.70	.75	.75	.80	.85	.85	.90	.95	90	5	6
-	-	-	.70	.70	.75	.75	.80	.80	.85	.90	130	4	5
10	9	8	7	6	5	4	3	2	1	0		0 - 36	36 - 72
ALTITUDE IN FEET X 1000											or 0-0.040 in. or 0.040-0.050		
											BARREL CLUSTER ROUNDS FIRED * X 1000		

★ REFER TO SYSTEM
LOG BOOK

PREPARATION FOR FIRING – Continued

BALLISTICS VALUES – Continued

Table 2-3. M220 Ammo Muzzle Velocity Value Chart

AIR DENSITY											TEMPERATURE IN DEGREES FAHRENHEIT	MUZZLE VELOCITY VALUES		
.95	.95	1.00	1.05	1.05	1.10	1.15	1.20	-	-	-	-70	7	8	
.90	.90	.95	1.00	1.00	1.05	1.10	1.15	1.20	1.20	-	-50	7	8	
.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	1.15	1.20	-30	6	7	
.80	.80	.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	0	5	7	
.75	.75	.80	.80	.85	.90	.90	.95	1.00	1.00	1.05	30	5	6	
.70	.70	.75	.75	.80	.80	.85	.90	.90	.95	1.00	70	4	5	
-	-	.70	.70	.75	.75	.80	.85	.85	.90	.95	90	4	5	
-	-	-	.70	.70	.75	.75	.80	.80	.85	.90	130	3	4	
10	9	8	7	6	5	4	3	2	1	0	0 - 36	36 - 72		
ALTITUDE IN FEET X 1000													or 0-0.040 in.		or 0.040-0.050

* REFER TO SYSTEM
LOG BOOK

PREPARATION FOR FIRING – Continued

BALLISTICS VALUES – Continued

Table 2-4. PATEC Ammo Muzzle Velocity Value Chart

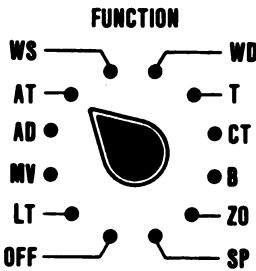
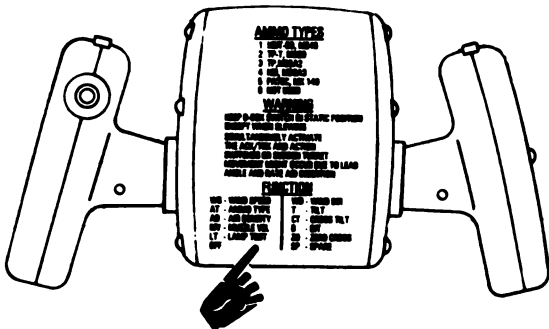
AIR DENSITY											TEMPERATURE IN DEGREES FAHRENHEIT	MUZZLE VELOCITY VALUES	
.95	.95	1.00	1.05	1.05	1.10	1.15	1.20	-	-	-	-70	8	9
.90	.90	.95	1.00	1.00	1.05	1.10	1.15	1.20	1.20	-	-50	7	8
.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	1.15	1.20	-30	7	8
.80	.80	.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	0	6	7
.76	.76	.80	.80	.85	.90	.90	.95	1.00	1.00	1.05	30	6	7
.70	.70	.75	.75	.80	.80	.85	.90	.90	.95	1.00	70	5	6
-	-	.70	.70	.75	.75	.80	.85	.85	.90	.95	90	5	6
-	-	-	.70	.70	.75	.75	.80	.80	.85	.90	130	4	5
10	9	8	7	6	5	4	3	2	1	0		0 - 36	36 - 72
ALTITUDE IN FEET X 1000												or 0-0.040 in. or 0.040-0.050	
												BARREL CLUSTER ROUNDS FIRED * X 1000	

* REFER TO SYSTEM
LOG BOOK

PREPARATION FOR FIRING – Continued

BALLISTICS VALUES – Continued

AT - Ammo Type.



1. Set the FUNCTION switch to the AT position. Check that the DISPLAY/ENTRY switch is set to ENTRY.
2. Determine the AMMO TYPE you are to use.
3. Find the AMMO TYPE on the AMMO TYPES chart on the hand control. The AMMO TYPE is identified by a single digit value (1 through 5).

AMMO TYPES

- 1 HEIT - SD, M246
- 2 TP - T, M220
- 3 TP, M55A2
- 4 HEI, M56A3
- 5 PATEC

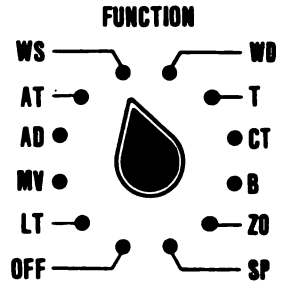
4. Update and enter the AMMO TYPE value.

PREPARATION FOR FIRING – Continued

BALLISTICS VALUES – Continued

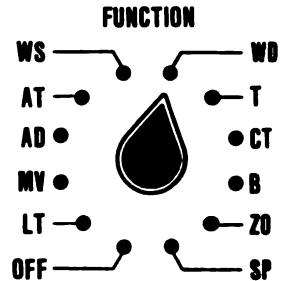
WS - Wind Speed.

1. Set the FUNCTION switch to the WS position. Check that the DISPLAY/ENTRY switch is set to ENTRY.
2. Determine the WIND SPEED in knots.
3. Update and enter the WIND SPEED value.



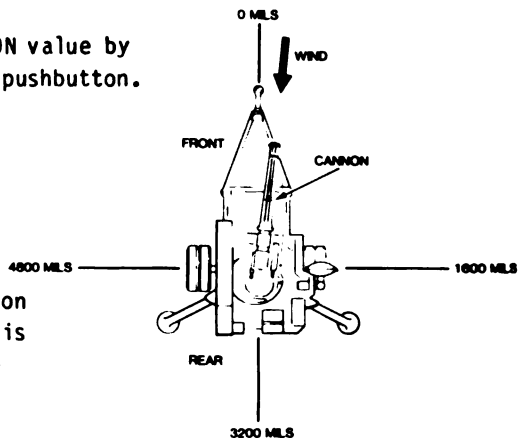
WD - Wind Direction.

1. Set the FUNCTION switch to the WD position. Check that the DISPLAY/ENTRY switch is set to ENTRY.
2. Determine the approximate wind direction.
3. Point the gun barrels INTO the wind.
4. The fire control system automatically determines the wind direction and displays it in mils on the VALUE display.
5. Enter the displayed WIND DIRECTION value by pressing and releasing the ENTER pushbutton.



NOTE

The wind direction may also be entered manually. Use this 480 diagram to estimate the direction of the cannon in mils (when it is pointed INTO the wind). Update and enter the estimated WIND DIRECTION value.



PREPARATION FOR FIRING – Continued

BALLISTICS VALUES – Continued

T - Tilt.

1. Set the FUNCTION switch to the T position.
2. Determine the TILT in degrees using the inclinometer.

NOTE

If the gun has been properly emplaced, the TILT will not exceed 10°.

3. Update and enter the TILT value. DIGIT 4 is used to enter the minus (-) or plus (=) sign.

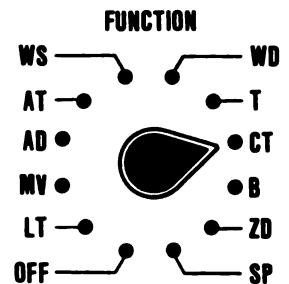
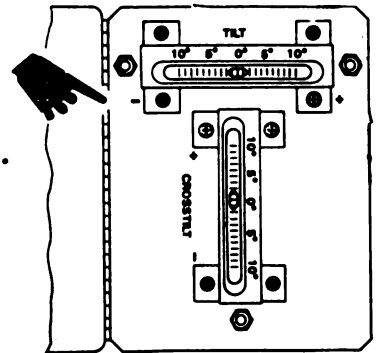
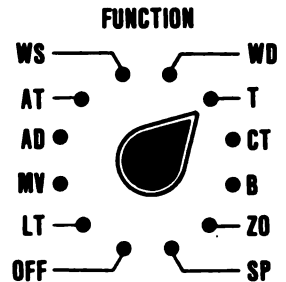
CT - Cross Tilt.

1. Set the FUNCTION switch to the CT position.
2. Determine the CROSS TILT in degrees using the inclinometer.

NOTE

If the gun has been properly emplaced, the CROSS TILT will not exceed 10°.

3. Update and enter the CROSS TILT value. DIGIT 4 is used to enter the minus (-) or plus (=) sign.



PREPARATION FOR FIRING – Continued

BALLISTICS VALUES – Continued

Verification.

1. Set the DISPLAY/ENTRY switch to DISPLAY.
2. Rotate the FUNCTION switch in turn to MV, AD, AT, WS, WD, T, and CT. Check that the VALUE display shows the correct values for each position. Be certain to update the values as local conditions change.
3. Set the FUNCTION switch to B (BIT) and the DISPLAY/ENTRY switch to DISPLAY for normal operation.

DISPLAY



ENTRY

END

PRECAUTIONS WHEN FIRING

PRECAUTIONS WHEN FIRING

2-8 General. Before, during, and after firing, always be prepared for any malfunction that could cause a potential hazard to personnel or equipment.

WARNING



If cannon cannot be cleared, keep it positioned in a direction so that possible damage or loss of life will not result if ammunition **COOK-OFF** occurs. If there is danger of a **COOK-OFF**, personnel should remain out of range or in shielded positions until after the barrels cool (about 30 minutes).



WARNING

COOK-OFF

If the gun clear switch is inadvertently left in the **OFF** position, the potential for **COOK-OFF** increases significantly.

**COOK-OFF**

If an unexpended round remains in a hot barrel, it may be detonated by the residual heat. This is called a **COOK-OFF**. If this happens, loss of life and destruction of the cannon can occur. Under all usual conditions, the **GUN CLEAR** switch on the control assembly will be set to the **AUTO** position so that the cannon clears automatically at completion of the firing cycle. However, if the switch has been left in the **OFF** position, or the cannon fails to clear for any other reason, the operator must attempt to clear the cannon immediately.

CAUTION

Torque muzzle clamp to 600-650 in.-lb every 12,000 rounds fired.

PRECAUTIONS WHEN FIRING – Continued

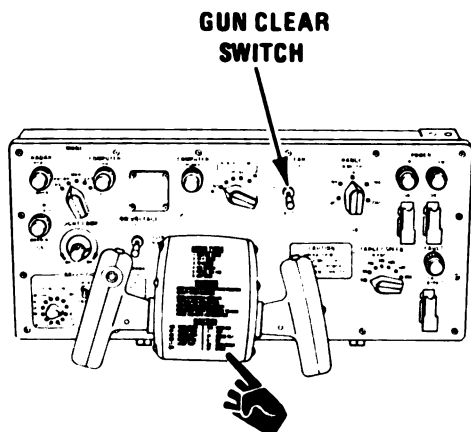
Operator Clearing.

Aim cannon towards a safe area.

Hold GUN CLEAR switch in OPERATOR position and press the ACQ/TRK pushbutton and either action switch.

If the cannon does not clear, quickly depress the SYS PWR circuit breaker on the distribution box and try to clear the cannon. If the cannon will not clear, cage the sight, set SYSTEM POWER to OFF, take cover, and notify organizational maintenance.

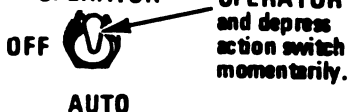
NOTE. Using right hand to activate GUN CLEAR switch and left hand to depress left-hand ACTION switch will eliminate accidental activation of the firing trigger.



**GUN CLEAR
OPERATOR**



**GUN CLEAR
OPERATOR**



WARNING



HANG-FIRE During firing, a round may not fire until after the clearing cycle starts. This is a **HANG-FIRE** and can result in death or injury to personnel and damage to the cannon. If ammunition doesn't fire normally, immediately stop firing and take cover. Dispose of defective ammo according to TM 9-1300-206 and/or local regulations.



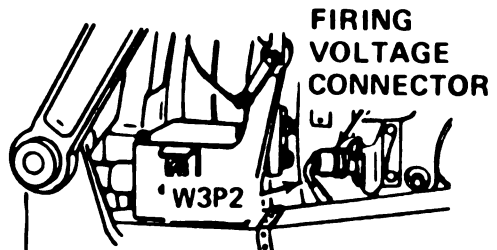
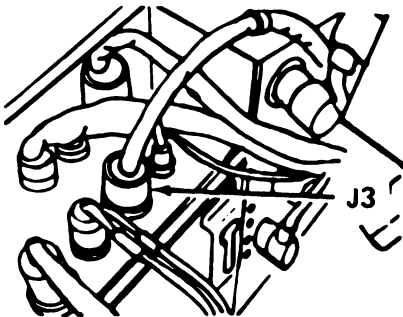
PRECAUTIONS WHEN FIRING — Continued

STOPPAGES

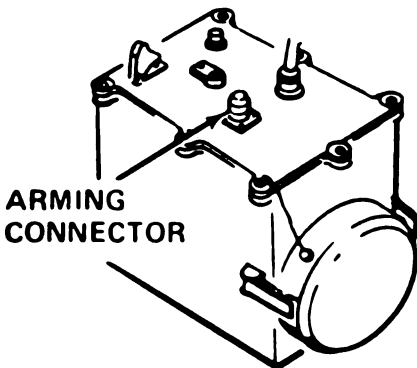
A stoppage is the result of an unexpected occurrence that interrupts the firing cycle and/or prevents the firing of the cannon on command from the gunner. Always clear the cannon immediately after a stoppage that occurs during a firing cycle (see operator clearing). This must be done to prevent a COOK-OFF. If cannon will not clear, take cover for 30 minutes until the barrels cool before trying to find the cause of the stoppage.

Correcting a Stoppage. After all danger of a cook-off has passed, attempt to isolate the cause of a stoppage by performing the following steps:

- 1 Set control assembly GUN CLEAR switch to AUTO. Inspect cannon and feed system. Make certain ammo is not binding in feed chute or storage can.
- 2 Attempt to fire a 10-round burst. If cannon fires and clears properly, continue operation.
- 3 If the cannon can be cleared manually but will not cycle electrically, (and no sign of obstruction can be found) check the following:
 - a. W3P1 connector connected to J3 on the distribution box.



- b. The firing voltage connector is securely mounted with W3P2 securely connected.



- c. The arm-safe cable or arming connector securely connected to J2 on the firing interrupter.

- 4 If cannon still will not fire, notify organizational maintenance.

PRECAUTIONS WHEN FIRING – Continued

LOW VOLTAGE PROTECTION CIRCUIT

If the LOW VOLTAGE WARNING indicator on the control panel flashes, you should stop firing and take action to correct the low voltage condition (Troubleshooting page 3-113).

**WARNING**

If involved in a tactical situation and the LOW VOLTAGE WARNING indicator begins to flash, immediately override low voltage protection circuit and continue firing.

CAUTION

Do not override low voltage protection circuit unless absolutely necessary. Low voltage conditions can cause permanent damage to the radar. The OVERRIDE function provides only for situations when the gunner must continue to fire in the MAN, EXT, or RADAR mode regardless of the consequences to the system.

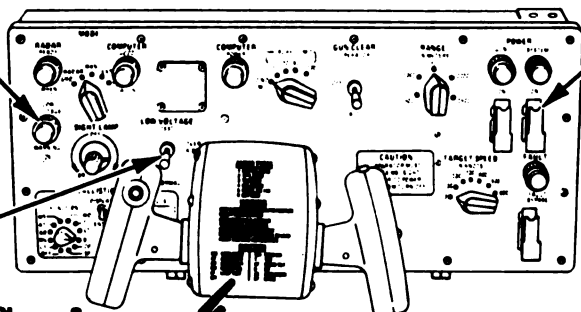
How to Override Low Voltage Protection Circuit.

- 1 When the LOW VOLTAGE WARNING indicator is flashing, prevent automatic interruption of fire control power by setting the LOW VOLTAGE switch to the OVERRIDE position and continue operating with reduced power.
- 2 When the LOW VOLTAGE WARNING indicator is lit continuously and fire control power has been interrupted, immediately cage sight, set SYSTEM POWER to OFF, set LOW VOLTAGE to OVERRIDE, wait ten seconds, then set SYSTEM POWER to ON and uncage sight. This will restore reduced power and allow operation of the system for a limited time.

**LOW VOLTAGE
WARNING
indicator**

**SYSTEM POWER
switch**

**LOW
VOLTAGE
switch**



2-64

Change 2

PRECAUTIONS WHEN FIRING – Continued

FAULT BYPASS CIRCUIT

USE DURING TACTICAL OPERATIONS



WARNING



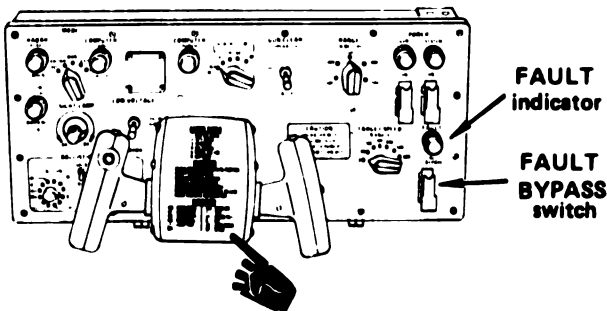
To prevent possible loss of turret movement and firing capability due to a fault, the system should be operated with the FAULT BYPASS switch in the ON (up) position. Turret runaway protection is disabled when FAULT BYPASS is ON. You must release the action switches immediately to cease any uncontrolled turret movement. FAULT BYPASS must be OFF (down) while performing maintenance actions or routine checks of the system.

USE DURING NORMAL CONDITIONS

If the FAULT indicator on the control panel flashes, you should stop firing and take action to correct the fault (Troubleshooting page 3-113).

How to Bypass Fault.

- 1 If the FAULT indicator flashes at a slow rate (1 time per second), the mode currently selected by the MODE switch is not restricted. DO NOT change the setting of the FAULT BYPASS switch. Continue to fire in the MODE selected. Attempt to locate and correct the fault when the situation permits.
- 2 If the FAULT indicator flashes at a fast rate (4 times per second), the mode selected by the MODE switch is restricted by the fault. If the situation permits, turn the MODE switch to each position until the FAULT indicator flashes at a slow rate and continue to fire in that mode.





WARNING



Turret runaway protection is disabled when FAULT BYPASS is ON. Warn all personnel in the area. You must release the action switches immediately to cease any uncontrolled turret movement. FAULT BYPASS must be OFF (down) while performing maintenance actions or routine checks of the system.

- 3 If all modes are restricted and you must continue to fire, select an appropriate mode, set the FAULT BYPASS switch to ON (up), and continue to fire.

FIRING

2-9 General. The weapon system can be operated in four different modes. Selection of the proper mode and firing rate depend on the target and tactical circumstances. Both aerial and ground targets can be engaged. The following paragraphs briefly describe each mode as well as other factors involved in firing the gun system. In the manual, external and radar mode the ACQ/TRK pushbutton and the action switch must be depressed simultaneously to obtain turret movement.

2-10 Radar Mode. The greatest accuracy against aerial targets is obtained in the radar mode. Using information obtained from the radar, the fire control system automatically computes target speed and range data and furnishes lead angle information to the M61A1 sight. Fixed ground points can also be ranged and used as target references so that if the radar malfunctions or is jammed, the manual or ground modes can be used to continue firing.



WARNING



ACQ/TRK push button must be pressed prior to squeezing action switch or unexpected gun movement may occur.

While operating in the RADAR, MANUAL, EXTERNAL or the TEST MODES, do not attempt to command the cannon in elevation after it has reached maximum elevation (contacted the mechanical stop). The turret will rotate unexpectedly at an uncontrolled rate until the action switches are released.

2-11 Manual Mode. The manual mode is normally used against aerial targets, but can also be used against ground targets. A lead angle for moving targets and superelevation for fixed or moving targets are provided by the fire control system. The gunner presets the TARGET RANGE and TARGET SPEED knobs on the control panel to the estimated target speed and range. The experienced gunner uses the radar mode and clutter lockon test to determine the ranges of several fixed ground points for reference. The gunner then concentrates on firing in the manual mode when the target is at the same distance as one of the reference points.

2-12 Ground Mode (NORM and STATIC). The ground NORM mode is used against ground targets. The M61A1 sight is used to sight on the target. Depending on visibility, the straight telescope or night sight can also be used. Firing can be adjusted by elevating or traversing the cannon as required. In the ground STATIC mode, the cannon is used against a specific ground target or area and cannot be moved in elevation or azimuth. Again, the experienced gunner uses the radar mode and clutter lockon test to determine the ranges of several fixed ground points for reference, then fires in the ground mode when the target is at the same distance as one of the reference points.

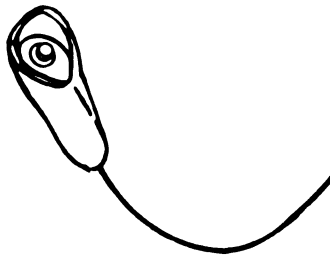
FIRING – Continued

2-13 External Mode. The external mode may be used against aerial or ground targets. Two operators are required, one to operate the cannon and one to operate an external range control unit for range setting. The range setter estimates the target range and enters the information on the external range control unit, which enables a ballistics solution to be generated by the fire control system. The M61A1 sight READY-TO-FIRE indicator informs the cannon operator when the target is within ammunition range.

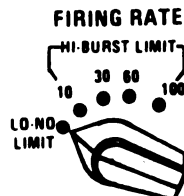
PROCEDURE INDEX

<u>PROCEDURE</u>	<u>PAGE</u>
Radar Mode	2-70
Manual Mode . . .	2-74
Ground Mode	
(NORM)	2-77
(STATIC)	2-80
External Mode . .	2-82

2-14 Firing With Remote Arm-Safe Switch. The remote arm-safe switch assembly is connected in place of the arming connector to J2 on the firing interrupter. With the arm-safe switch connected, the cannon will not fire until the ARM pushbutton is pressed and held.



2-15 Firing rates. Two FIRING RATE choices are available to the gunner: LO (1000 shots per minute) and HI (3000 shots per minute with BURST LIMIT selections of 10, 30, 60, or 100 rounds).



FIRING – Continued

2-16 Automatic Clearing. The GUN CLEAR switch on the control assembly must always be set to the AUTO position before firing. The cannon then clears itself automatically after every firing cycle. Refer to "Precautions When Firing" (page 2-61) for additional information on clearing the cannon.

WARNING



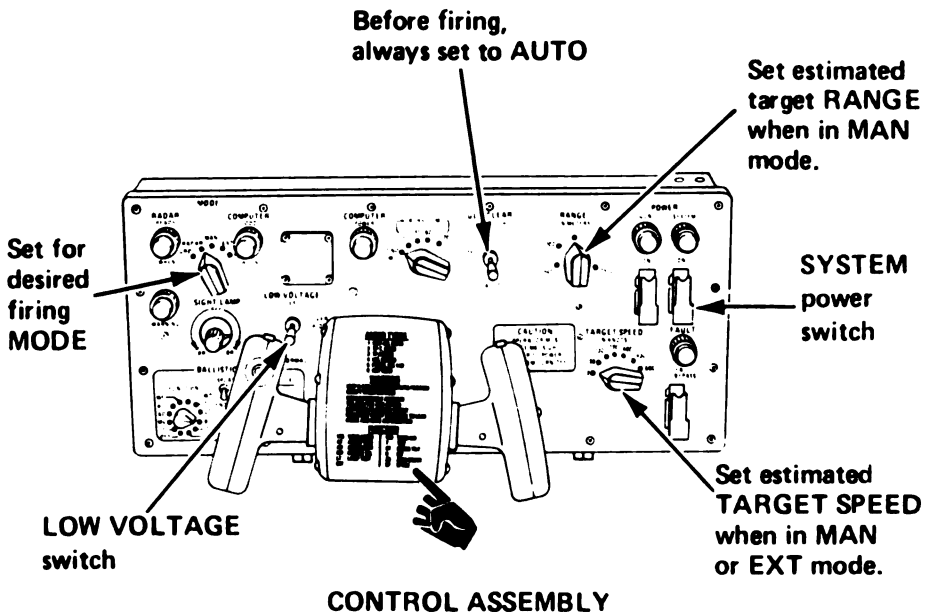
If cannon is not cleared immediately after firing, danger of a cook-off exists. Keep cannon aimed at the target area until cannon has been cleared. Refer to COOK-OFF (page 2-61).



WARNING



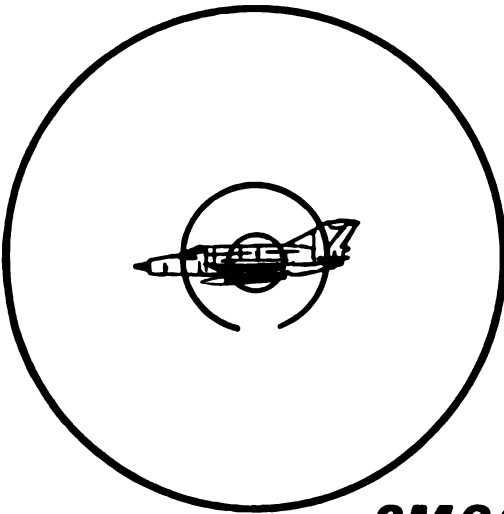
During a firing cycle, if the ammunition does not fire normally (hang-fire condition), firing operations shall be terminated immediately. Personnel will take cover until cannon has been cleared and defective ammunition disposed of. Refer to HANG-FIRE (page 2-62).



FIRING – Continued

2-17 Marksmanship. The M61A1 sight, fire control processor (FCP), and AN/VPS-2A radar automatically compute the correct lead angle required to hit an aerial target. You, however, must also do your part. The key to good marksmanship is tracking the target smoothly after it has been centered in the 5 mil sight reticle. **SMOOTH TRACKING IS IMPORTANT**. The lead angle and rate aid solutions are based on the gunner's tracking. It is important to track smoothly and accurately, keeping the target centered in the 5 mil sight reticle.

- 1 When tracking begins, the line-of-sight and cannon line-of-sight are both pointing to the target. When the FCP receives range information from the radar, the TRACK/JAM/RADIATE indicator lights continuously to indicate that the radar is tracking.
- 2 The FCP produces a lead angle and rate aid information based on the gunner's track. The line-of-sight remains on the target, but the cannon moves ahead of the target according to the information provided by the FCP.



***SMOOTH TRACKING
DOES IT.***

- 3 The READY-TO-FIRE indicator lights after rate aid starts if the predicted target impact point is:
 - 1600 meters or less for M246 ammunition
 - 1500 meters or less for M220 ammunition
 - 2500 meters or less for PATEC ammunition
- 4 As soon as the target can be tracked smoothly in the center of the 5 mil reticle and the READY-TO-FIRE indicator is lit, you can begin firing.

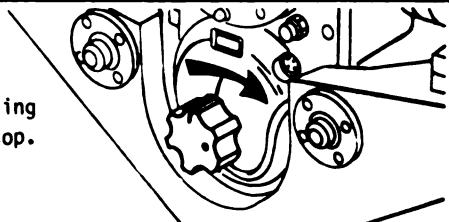
FIRING — Continued

RADAR MODE

1 Do your PREPARATION FOR FIRING (page 2-41).

2 Set distribution box NORM-STATIC-TEST switch to NORM.

3 Check that sight is caged by rotating the CAGED knob clockwise to its stop.



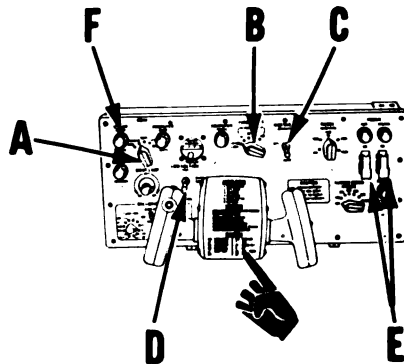
4 Set MODE select switch (A) to RADAR.

Set FIRING RATE switch (B) to desired HI-BURST LIMIT (high rate).

Set GUN CLEAR switch (C) to AUTO.

Set LOW VOLTAGE switch (D) to NORMAL.

Set SYSTEM and GUN POWER switches (E) to ON.



5 Turn sight CAGED knob fully counter-clockwise to uncage sight.

IMPORTANT: Let radar warm up 2-1/2 minutes before using radar. The RADAR READY WHEN LIT indicator (F) lights when the radar is ready.

NOTE

In the RADAR mode, with the hand control action switches released, the sight reticle will be in constant motion. This self-zeroing feature is normal. The sight reticle stabilizes when the action switches are pressed.

FIRING – Continued

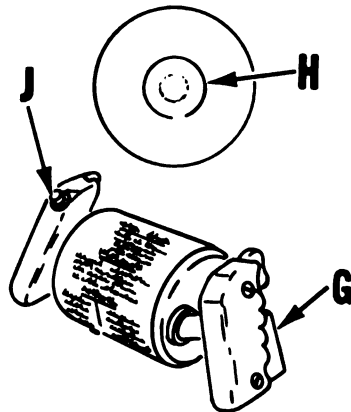
RADAR MODE – Continued

6

WARNING

While operating in the RADAR, MANUAL, EXTERNAL or the TEST MODES, do not attempt to command the cannon in elevation after it has reached maximum elevation (contacted the mechanical stop). The turret will rotate unexpectedly at an uncontrolled rate until the action switches are released.

Simultaneously press the action switch (G), ACQ/TRK pushbutton (J), and footswitch (I) while locating and centering the target in the 5 mil sight reticle (H).



7

Smoothly continue tracking the target until the range meter stops sweeping and indicates target range.

Release the ACQ/TRK pushbutton. The TRACK/JAM/RADIATE indicator on the sight will light continuously, indicating that the radar is locked on target.

**NOTE**

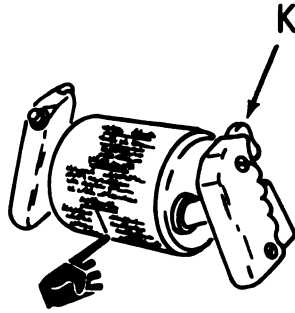
Before firing, check that the target range appears correct. If the range meter is erratic, press and release ACQ/TRK to reengage target.

FIRING – Continued

RADAR MODE – Continued

8

As the rate aid and lead angle are inserted by the fire control system, gradually back off on the hand control until it reaches its center position. (This should occur within 4 seconds of releasing the ACQ/TRK pushbutton.)



WARNING



Observe warnings and know procedures on cookoffs, hangfires, stoppages, and low voltage (pages 2-61 through 2-64).



CAUTION

If firing in LO rate, release trigger to stop firing. DO NOT attempt to fire a burst of less than 10 rounds. If firing in HI rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

The READY-TO-FIRE indicator will light when the predicted target impact point is within ammunition range. You may then begin firing by depressing trigger (K).

FIRING — Continued

RADAR MODE — Continued

9

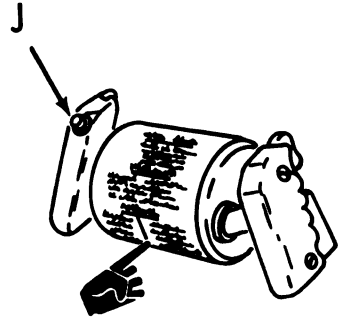
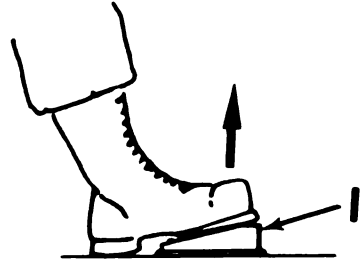
IMPORTANT: If the TRACK/JAM/RADIATE indicator blinks slowly (once per second), the radar is being jammed.

NOTE

A jamming indication can occur when tracking propeller driven aircraft or helicopters and should be ignored for these aircraft.

To reject a target in case of radar jamming, perform one of the following:

- 1 Release the footswitch (I).
- 2 Press the ACQ/TRK pushbutton (J).
- 3 Set the MODE switch to MAN. Set the target range and speed and proceed to fire in the manual mode (for aerial or ground targets) or the ground mode (for ground targets only).



NOTE

Before firing becomes necessary, it is a good idea to determine the range of several fixed ground points for reference in case the radar malfunctions or is jammed while firing. The ground points can then be used as target references when firing in the manual or ground modes.

To determine the range of a fixed ground point, perform the clutter lockon test (page 2-48) and note the range on the target range meter for each of the selected ground points. **IMPORTANT:** Return the CLUTTER LOCKON switch to NORMAL and the MODE switch to RADAR at the end of the clutter lockon test.

Release switches and cage sight before turning SYSTEM POWER to OFF.

END

FIRING — Continued

MANUAL MODE

1

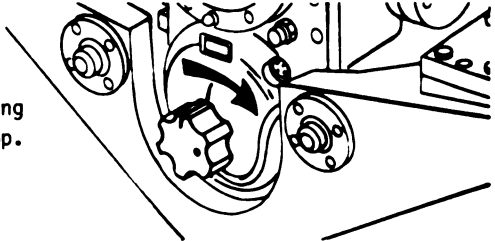
Do your PREPARATION FOR FIRING (page 2-41).

2

Set distribution box NORM-STATIC-TEST switch to NORM.

3

Check that sight is caged by rotating the CAGED knob clockwise to its stop.



4

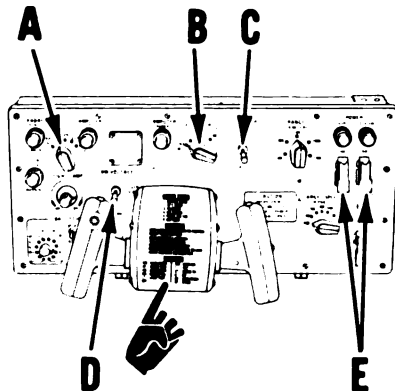
Set MODE select switch (A) to MAN. (In MAN mode, the radar and TRACK/JAM/RADIATE indicator are inoperative.)

Set FIRING RATE switch (B) to desired HI-BURST LIMIT (high rate) or LO-NO LIMIT (low rate).

Set GUN CLEAR switch (C) to AUTO.

Set LOW VOLTAGE switch (D) to NORMAL

Set SYSTEM and GUN POWER switches (E) to ON.



5

Turn sight CAGED knob fully counterclockwise to uncage sight.



NOTE

In the MANUAL mode, with the hand control action switches released, the sight reticle will be in constant motion. This self-zeroing feature is normal. The sight reticle stabilizes when the action switches are pressed.

FIRING – Continued

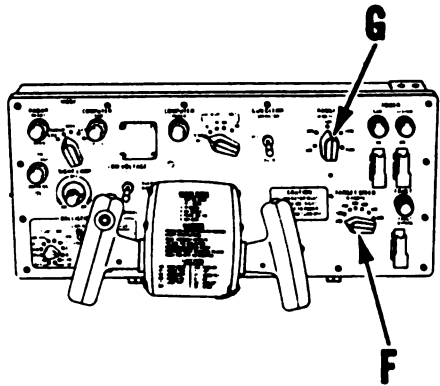
MANUAL MODE – Continued

6

When target is observed:

Set TARGET SPEED knob (F) to estimated target speed with respect to ground.

Set RANGE knob (G) to estimated range of target.



7

WARNING

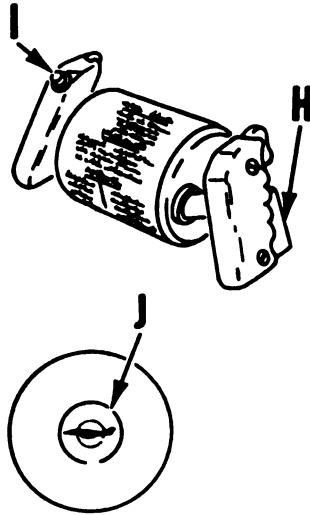
ACQ/TRK Push Button must be pressed prior to Squeezing Action Switches.

While operating in the RADAR, MANUAL, EXTERNAL or the TEST MODES, do not attempt to command the cannon in elevation after it has reached maximum elevation (contacted the mechanical stop). The turret will rotate unexpectedly at an uncontrolled rate until the action switches are released.

Simultaneously press the ACQ/TRK pushbutton (I) and the action switch (H), THEN locate and center the target in the 5 mil sight reticle (J).

Continue tracking the target until a smooth track is established.

Release the ACQ/TRK pushbutton (I) when the target reaches estimated range set by RANGE knob.



FIRING – Continued

MANUAL MODE – Continued

8

As the rate aid and lead angle are inserted by the fire control system, gradually back off on the hand control until it reaches its center position. (This should occur within 4 seconds of releasing the ACQ/TRK pushbutton.)



WARNING

Observe warnings and know procedures on cookoffs, hangfires, stoppages, and low voltage (pages 2-61 through 2-64).



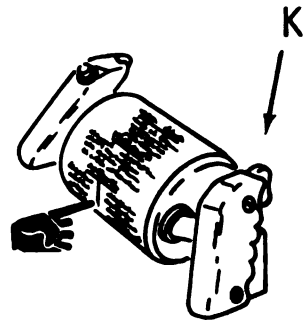
CAUTION

If firing in LO rate, release trigger to stop firing. DO NOT attempt to fire a burst of less than 10 rounds. If firing in HI rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

NOTE

To disengage the target being tracked, press and hold the ACQ/TRK pushbutton.

The READY-TO-FIRE indicator will light when the predicted target impact point is within ammunition range. You may then begin firing by depressing trigger (K).



Release switches and cage sight before turning SYSTEM POWER to OFF.

END

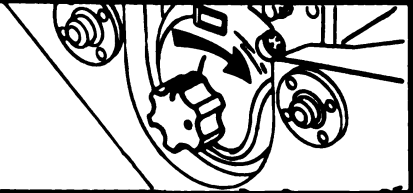
FIRING — Continued

GROUND MODE (NORM)

1 Do your PREPARATION FOR FIRING (page 2-41).

2 Set distribution box NORM-STATIC-TEST switch to NORM.

3 Check that sight is caged by rotating the CAGED knob clockwise to its stop.



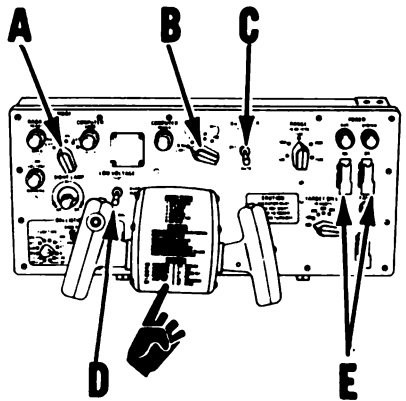
4 Set MODE select switch (A) to GRD. (In the GRD mode, rate aid and the READY-TO-FIRE indicator are inoperative. Ballistics data is not used in the GRD mode. The system will operate with the COMPUTER GOOD WHEN LIT indicator extinguished.)

Set FIRING RATE switch (B) to desired HI-BURST LIMIT (high rate) or LO-NO LIMIT (low rate).

Set GUN CLEAR switch (C) to AUTO.

Set LOW VOLTAGE switch (D) to NORMAL.

Set SYSTEM and GUN POWER switches (E) to ON.

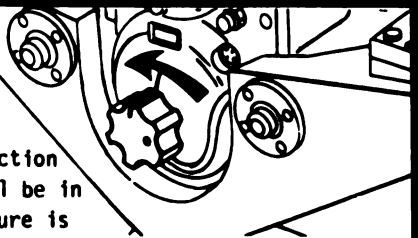


5 Turn sight CAGED knob fully counterclockwise to uncage sight.

NOTE

In the GRD mode, with the hand control action switches released, the sight reticle will be in constant motion. This self-zeroing feature is normal. The sight reticle stabilizes when the action switches are pressed.

If the sight fails in the GRD mode, cage the sight and continue operating. The system will be operational with reduced firing accuracy.

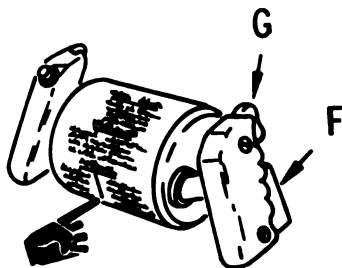


FIRING – Continued

GROUND MODE (NORM) – Continued

6

Press action switch (F) and position cannon to bear on target in azimuth and elevation. See page 2-79 for approximate sight picture/target size relationships.



WARNING



Observe warnings and know procedures on cookoffs, hangfires, stoppages, and low voltage (pages 2-61 thru 2-64).



CAUTION

If firing in LO rate, release trigger to stop firing. DO NOT attempt to fire a burst of less than 10 rounds. If firing in HI rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

Begin firing by depressing trigger switch (G).

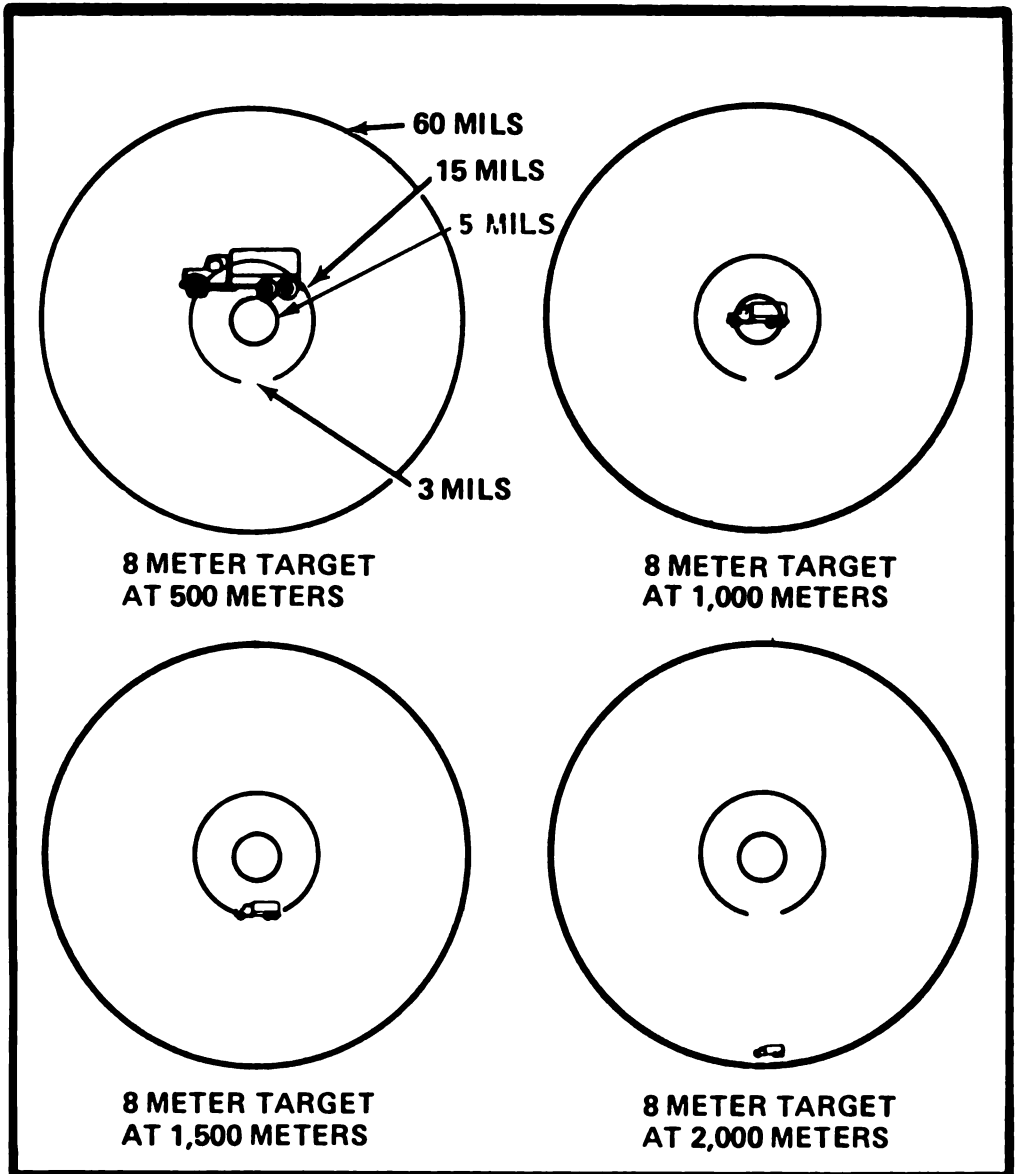
Release switches and cage sight before turning SYSTEM POWER to OFF.

END

FIRING – Continued

GROUND MODE (NORM or STATIC)

The following reticle patterns are approximations of target size and sight pictures for various ranges.



FIRING – Continued

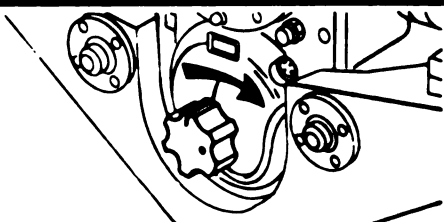
GROUND MODE (STATIC)

IMPORTANT: In the GRD (STATIC) mode, the servo drives are deenergized.
The cannon cannot be moved in azimuth or elevation during firing.

1 Do your PREPARATION FOR FIRING (page 2-41).

2 Set distribution box NORM-STATIC-TEST switch to NORM.

3 Check that sight is caged by rotating the CAGED knob clockwise to its stop.



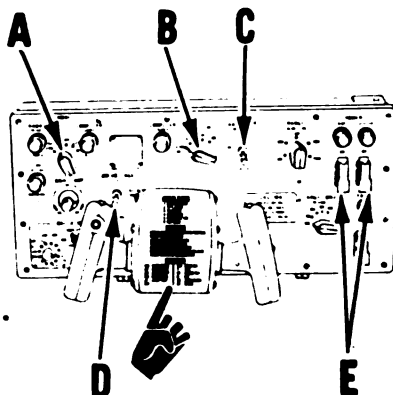
4 Set MODE select switch (A) to GRD. (In the GRD mode, rate aid and the READY-TO-FIRE indicator are inoperative.)

Set FIRING RATE switch (B) to desired HI-BURST LIMIT (high rate) or LO-NO LIMIT (low rate).

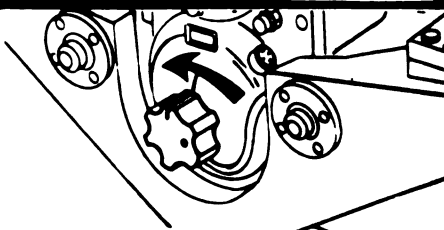
Set GUN CLEAR switch (C) to AUTO.

Set LOW VOLTAGE switch (D) to NORMAL.

Set SYSTEM and GUN POWER switches (E) to ON.



5 Turn sight CAGED knob fully counterclockwise to uncage sight.



NOTE

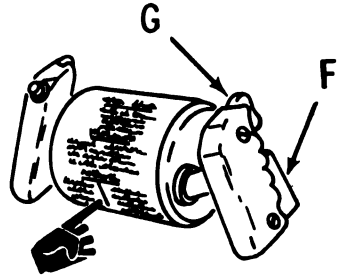
In the GROUND mode, with the hand control action switches released, the sight reticle will be in constant motion. This self-zeroing feature is normal. The sight reticle stabilizes when the action switches are pressed.

FIRING — Continued

GROUND MODE (STATIC) — Continued

6

Press action switch (F) and position cannon to bear on target in azimuth and elevation. See page 2-79 for approximate sight picture/target size relationships.



7

Set distribution box NORM-STATIC-TEST switch to STATIC (center position).



8

WARNING



Observe warnings and know procedures on cookoffs, hangfires, stoppages, and low voltage (pages 2-61 through 2-64).



CAUTION

If firing in LO rate, release trigger to stop firing. DO NOT attempt to fire a burst of less than 10 rounds. If firing in HI rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

If the situation permits, fire a short burst by depressing trigger (G) to check accuracy. If the burst is on target, proceed to fire. If the burst is not on target, set distribution box NORM-STATIC-TEST switch to NORM and repeat steps 6 through 8 to correct zero.

Release switches and cage sight before turning SYSTEM POWER to OFF.

END

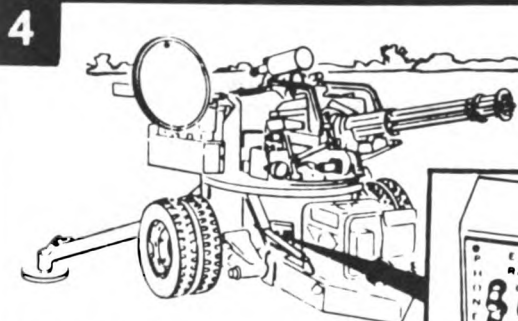
FIRING – Continued

EXTERNAL MODE

1 Do your PREPARATION FOR FIRING (page 2-41).

2 Set distribution box NORM-STATIC-TEST switch to NORM.

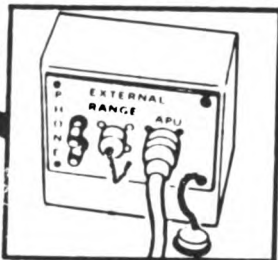
3 Check that sight is caged by rotating the CAGED knob clockwise to its stop.



Connect the external range control to the service panel EXTERNAL RANGE input.

NOTE

Firing in EXTERNAL mode requires a second person to operate the external range control.



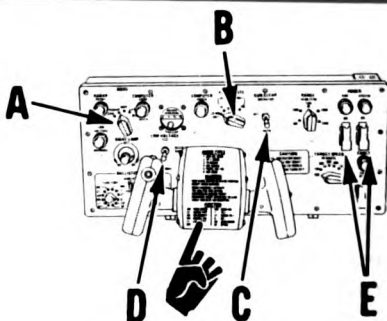
5 Set MODE select switch (A) to EXT.

Set FIRING RATE switch (B) to desired HI-BURST LIMIT (high rate) or LO-NO LIMIT (low rate).

Set GUN CLEAR switch (C) to AUTO.

Set LOW VOLTAGE switch (D) to NORMAL.

Set SYSTEM and GUN POWER switches (E) to ON.



IMPORTANT: If the ACQ/TRK pushbutton is depressed in the EXT mode, the external range control will become inoperative.

FIRING – Continued

EXTERNAL MODE – Continued

6

Turn sight CAGED knob fully counterclockwise to uncage sight.



NOTE

In the EXTERNAL mode, with the hand control action switches released, the sight reticle will be in constant motion. This self-zeroing feature is normal. The sight reticle stabilizes when the action switches are pressed.

7



WARNING



While operating in the RADAR, MANUAL, EXTERNAL or the TEST MODES, do not attempt to command the cannon in elevation after it has reached maximum elevation (contacted the mechanical stop). The turret will rotate unexpectedly at an uncontrolled rate until the action switches are released.

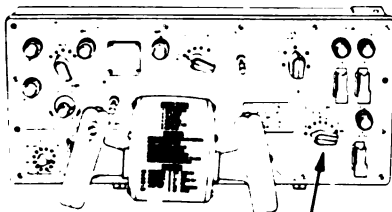
NOTE

Firing in the external mode requires a second person to operate the external range control.

When target is observed, the cannon operator and the external range setter perform the following steps:

Gunner

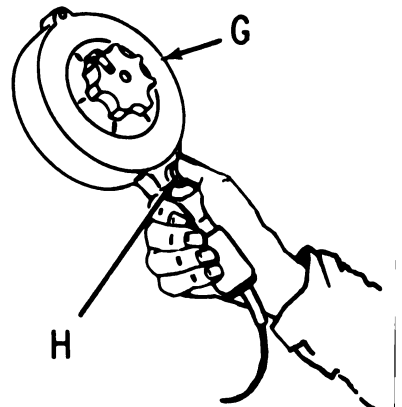
Set the TARGET SPEED knob (F) to the estimated target speed with respect to the ground.



F

External Range Setter

Set the METER X 100 knob (G) to the estimated target range.



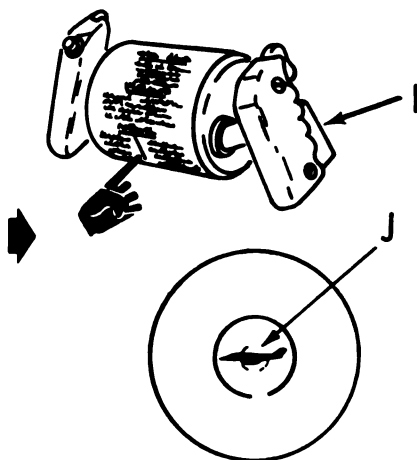
H

FIRING – Continued

EXTERNAL MODE – Continued

Gunner

Press either hand control action switch (I) and locate and center the target in the 5 mil sight reticle (J). Establish a smooth track. Inform the external range setter that target is tracked.



As the rate aid and lead angle are inserted by the fire control system, gradually back off on the hand control until it reaches its center position. (This should occur within 4 seconds of release of the external range enable pushbutton by the external range setter.)

External Range Setter

Inform the gunner that you are starting the ballistics solution. Press and release the external range enable pushbutton (H).

NOTE

To disengage the target being tracked, press and hold the ACQ/TRK pushbutton.

FIRING – Continued

EXTERNAL MODE – Continued

8

**WARNING**

Observe warnings and know procedures on cookoffs, hangfires, stoppages, and low voltage (pages 2-61 thru 2-64).

**CAUTION**

If firing in LO rate, release trigger to stop firing. DO NOT attempt to fire a burst of less than 10 rounds. If firing in HI rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

The READY-TO-FIRE indicator will light when the predicted target impact point is within ammunition range. You may then begin firing by depressing trigger.

Release switches and cage sight before turning SYSTEM POWER to OFF.

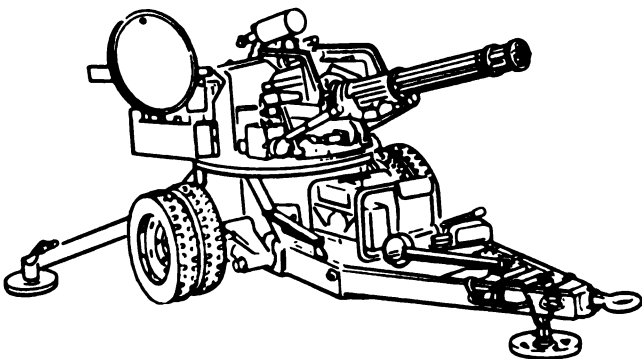
END

SECTION III .
OPERATING AUXILIARY
AND SUPPORT EQUIPMENT

2-18 General. This section contains information you need to identify, connect, protect, or operate auxiliary and support equipment used with the gun system. If an equipment problem or failure occurs during normal operation, see Chapter 4 for information on locating and correcting the problem.

PROCEDURE INDEX

<u>PROCEDURE</u>	<u>PAGE</u>
APU	2-93
BORESIGHT KIT	2-88
COMMUNICATIONS EQUIPMENT . . .	2-87
GUNNER'S QUADRANT	2-89
NIGHT VISION SIGHT	2-90
TADDs	2-96



COMMUNICATIONS EQUIPMENT

H-251/U HEADSET

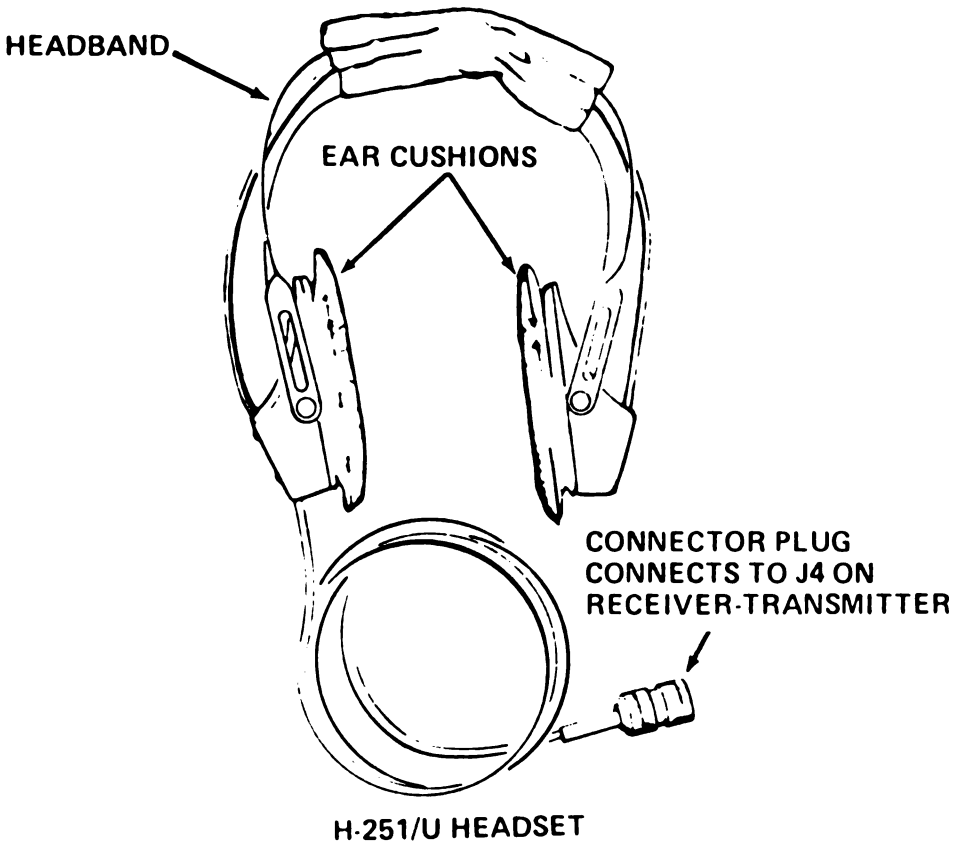
The H-251/U headset is used by operator to hear the lock-on signal from radar receiver-transmitter.

TA-312/PT TELEPHONE SET

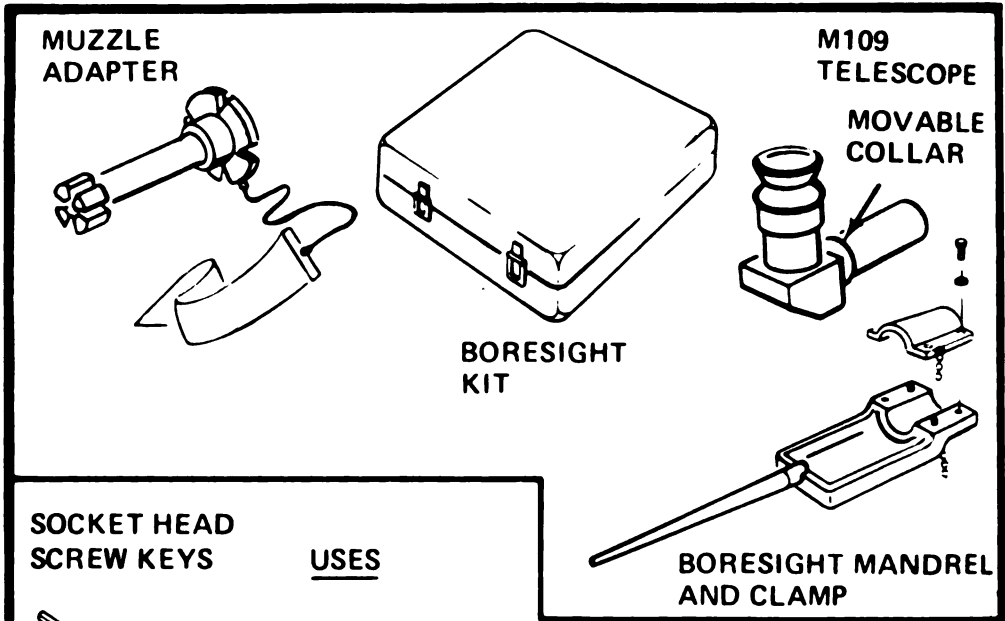
The TA-312/PT telephone set is used between the gunner and remotely located crew members.

RL-39/DR8 REEL AND HANDLE






The RL-39/DR8 reel and handle is used to carry communications wire for linking the remote phones with the gun.



BORESIGHT KIT



SOCKET HEAD SCREW KEYS USES

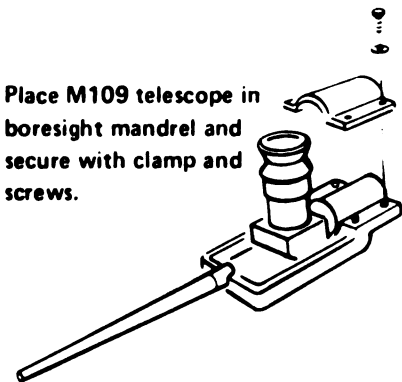
	5/64 x 1 7/8	-	Traverse adjustment locking clamp
	3/32 x 2 3/32	-	NONE
	7/64 x 2 7/32	-	Elevation input shaft universal joint
	1/8 x 2 11/32	-	NONE
	5/32 x 2 1/2	-	Boresight mandrel

NOTE

Movable collar must be removed and stowed in boresight kit.

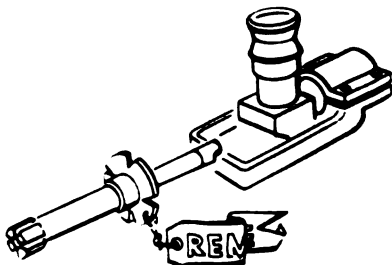
1

Place M109 telescope in boresight mandrel and secure with clamp and screws.



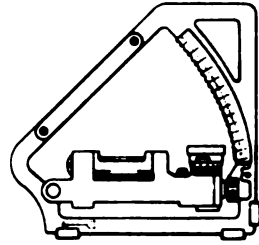
2

In use, the muzzle adapter fits into a cannon barrel, and the telescope and mandrel assembly is inserted into the muzzle adapter.



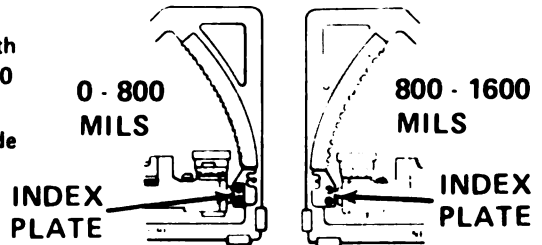
M1A1 GUNNER'S QUADRANT

The gunner's quadrant is used to measure angles of elevation in mils. To operate the quadrant a few basic features of the quadrant must be understood.



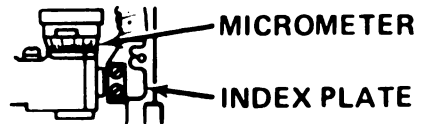
1

The coarse scale is laid out on both sides of the frame, graduated in 10 mil increments, and numbered every 50 mils. The reading is made at the index plate.



2

The fine scale is laid out on a micrometer dial, and graduated in 0.2 mil graduations from 0 to 10 mils.



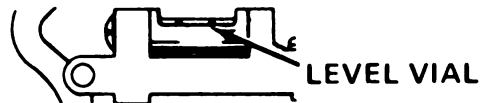
3

The **LINE OF FIRE** arrow must be pointed in the line of fire when making a measurement, except when measuring negative angles. For this, reverse the **LINE OF FIRE** arrow.



4

The level vial with bubble must indicate level before readings can be taken with the quadrant.



5

The gunner's quadrant plate must be cleaned of all dirt and foreign material before readings can be taken with the quadrant.

**TO OPERATE THE GUNNER'S QUADRANT**

1. Place quadrant on quadrant plate with the **LINE OF FIRE** arrow pointing in the line of fire. (For negative angles reverse **LINE OF FIRE** arrow.)
2. Release spring loaded index plate. Coarse adjust to obtain a coarse level in the level vial, then fine adjust by turning the micrometer to obtain a true level.
3. Make certain that the color is the same on both the coarse and the fine adjustment areas, then add the coarse and fine readings. The sum of the coarse and fine readings equal the mils of the angle measured. For further information refer to TM 9-1290-200-14&P.

AN/TVS-2B NIGHT VISION SIGHT

The AN/TVS-2B night sight is mounted to the right of the M61A1 sight and may be installed or removed by the crew. Detailed instructions on operation and maintenance are contained in TM 11-5855-202-13.



WARNING

A residual charge of approximately 45,000 volts exists after power is turned off. Always wait five minutes after shutdown before removing battery.

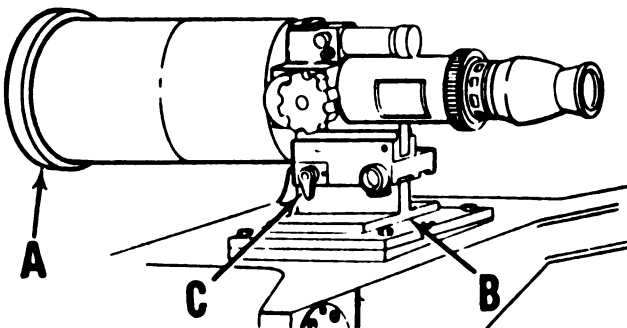


INSTALLATION

1. Open PRESSURE EQUALIZER according to instruction plate before releasing carrying case latches.
2. Open case and remove sight from case. Install battery BA-1100/U.
3. **IMPORTANT** - Do not remove adjustable lens cover (A) during daylight, and make sure aperture of cover is closed. Sunlight or other intense light can cause damage.
4. Install sight on dovetail mount (B) to right of M61A1 sight and push forward to stop.
5. Secure sight by tightening locking knob (C) on the left of the mounting.
6. Boresight according to page 3-74.

REMOVAL

1. **IMPORTANT** - Do not remove adjustable lens cover (A) during daylight, and make sure aperture of cover is closed. Sunlight or other intense light can cause damage.
2. Unlock knob (C) and remove sight from dovetail mount (B).
3. **IMPORTANT** - Make sure that both sight and sight case are completely dry before storing sight in case.
4. Remove battery and stow in case. Place sight in case. Close and latch cover.



AN/TVS-5 NIGHT VISION SIGHT

The AN/TVS-5 night sight is mounted to the right of the M61A1 sight and may be installed or removed by the crew. Detailed instructions on operation and maintenance are contained in TM 11-5855-214-10.

WARNING



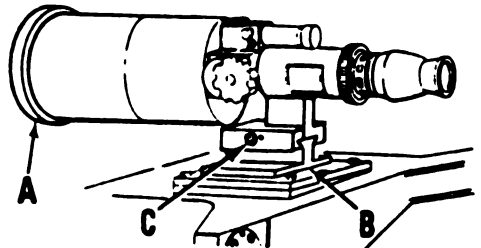
A residual charge of approximately 45,000 volts exists after power is turned off. Always wait five minutes after shutdown before removing battery.

INSTALLATION

1. Open PRESSURE EQUALIZER according to instruction plate before releasing carrying case latches.
2. Open case and remove sight from case. Install battery BA 1567/U.
3. **IMPORTANT** – Do not remove adjustable lens cover (A) during daylight, and make sure aperture of cover is closed. Sunlight or other intense light can cause damage.
4. Remove existing mount from AN/TVS-5 Sight and stow in case.
5. Install Mounting Adapter, P/N 12011766, on AN/TVS-5 Sight with the two screws removed from original mount as shown in figure.
6. Loosen bolt on side of mounting adapter and install sight on dovetail mount (B) to right of M61A1 sight and push forward to stop.
7. Secure sight by tightening bolt on right side of mounting adapter.
8. Boresight according to page 3-74.

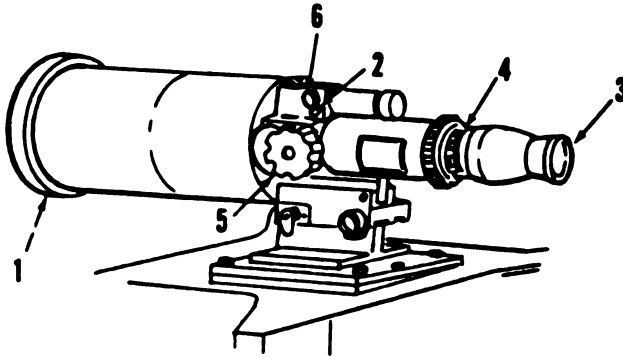
REMOVAL

1. **IMPORTANT** – Do not remove adjustable lens cover (A) during daylight, and make sure aperture of cover is closed. Sunlight or other intense light can cause damage.
2. Loosen bolt (C) and remove sight from dovetail mount (B).
3. **IMPORTANT** – Make sure that both sight and sight case are completely dry before storing sight in case.
4. Remove battery and stow in case. Place sight in case. Close and latch cover.



AN/TVS-2B OR AN/TVS-5 NIGHT VISION SIGHT – Continued

The night sight is mounted to the right of the M61A1 sight and may be installed or removed by the crew. (See page 2-90 or 2-91 for removal and installation instructions.) Instructions for operation of the night sight are listed below.



1. During daylight hours, turn the aperture selector on the boresight cover (1) to the nearest position. If image being viewed is not clearly visible, adjust the aperture to a less dark position.

CAUTION

Remove boresight cover only during conditions of darkness.

2. Place three position rotary control switch (2) in third (SIGHT AND RETICLE) position.

WARNING



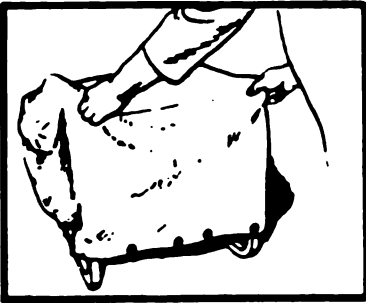
When operating the sight at night, keep the eyeshield firmly against the face. Failure to do so, will result in your face being illuminated by the backglow from the sight.



3. Look through eyeshield (3) for proper image and reticle pattern.
4. Adjust eyepiece focus ring (4) for sharp reticle pattern.
5. Adjust objective lens focus knob (5) for clear image.
6. Adjust reticle intensity adjustment (6) for desired reticle brightness.
7. Turn off equipment by placing three position rotary control switch (2) to first (OFF) position.

AUXILIARY POWER UNIT (APU)

SETTING UP THE APU

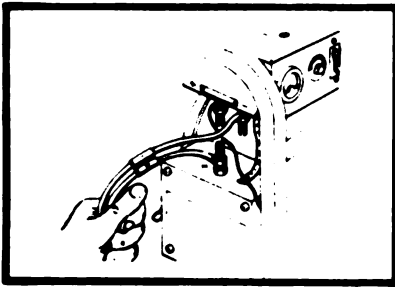


Remove APU cover and stow.
Make sure APU OFF-RUN switch
is in OFF position.

NOTE

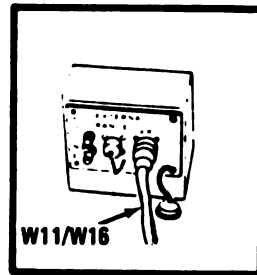
W11 lead is used when APU is dismantled from the carriage. W16
is used when APU is mounted on the carriage.

CAUTION



Make sure lead from circuit
protector to positive (+)
terminal of control box is
connected securely
Make sure that W11 or W16 cable
lead marked negative (-) is connected
to the negative terminal on DC
control box and that cable lead
marked positive (+) is connected
to terminal on circuit protector
box.

Connect APU power
cable (W11 or W16) to
service panel on
carriage.



AUXILIARY POWER UNIT (APU) – Continued

OPERATING THE APU

WARNING

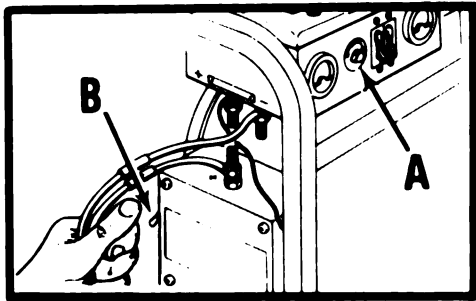
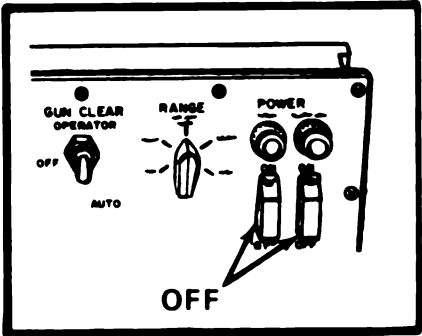


Do not operate APU until you are familiar with operating procedures in TM 5-6115-323-14. The APU produces ample electrical power to cause injury and pain if normal safety precautions are not observed.



Do your daily preventive maintenance checks and services (PMCS). See TM stowed in APU cover pocket.

SYSTEM POWER and GUN POWER switches on control panel set to OFF position.



Set APU variable resistor knob (A) to vertical. Ensure circuit protector ON-OFF switch (B) is OFF.

WARNING

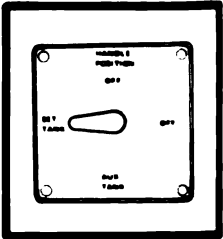


Do not fill fuel tank while APU is running. Also, make metal to metal contact between container and fuel tank when filling.

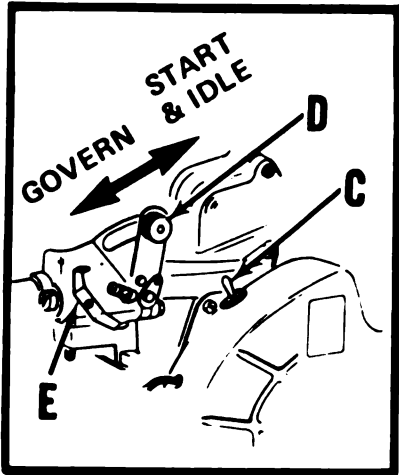


Set fuel valve handle to OFF. Fill tank with fuel.
Set fuel valve handle to SET TANK.

NOTE: AUX TANK position is used only if external fuel tank is connected.



AUXILIARY POWER UNIT (APU) – Continued



CAUTION

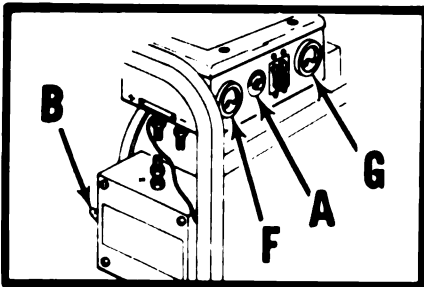
Never allow DC volts meter (F) to indicate over 28.7 volts.



Set OFF-RUN switch (C) to RUN.
Set carburetor control (D) to START & IDLE.
Set choke lever (E) to CHOKE (if engine is cold).
Crank engine with starter rope and move choke lever (E) to off when engine starts. Don't overchoke.
Move carburetor control (D) to GOVERN and lock after engine starts.

NOTE

Don't adjust or apply load until engine runs smoothly with control set at GOVERN.



CAUTION

If circuit protector ON-OFF switch (B) trips for an unknown reason, it will reset by itself. If it trips again, notify organizational maintenance.



Set circuit protector ON-OFF switch (B) to ON. Adjust variable resistor knob (A) until DC VOLTS meter (F) indicates 27.5-28.7 volts.

If APU PERCENT LOAD METER (G) indicates over 100% when load is applied, the batteries need to be charged (page 3-133).

SHUTTING DOWN THE APU



Set circuit protector ON-OFF switch (B) to OFF.



Set carburetor control (D) to START & IDLE.



Set OFF-RUN switch (C) to OFF.

For further information refer to TM 5-6115-323-14.

END

TARGET ALERT DATA DISPLAY SET (TADDS)

2-19 General. The purpose of the TADDS is to receive and display target intelligence information from the radar data link transmitter for use by air defense weapon emplacements. The TADDS also allows its operators to listen to voice commands from the radar set operator.

RADAR SYSTEM RELATIONSHIP

The TADDS works together with the radar set to accomplish its mission. The Forward Area Alerting Radar (FAAR) System acquires and identifies aircraft contacts within its range and altitude limits. The target data is shown on the radar set PPI display that has a grid pattern similar to that of the TADDS. Grid coordinate location data and status data of aircraft are transmitted to the TADDS by the radar set operator using the radio frequency data link (RFIDL) transmitter. This information is received by the TADDS and presented on the data display matrix centered on the position of the radar set. The TADDS operator determines the relative position of targets with respect to his site by orienting the TADDS with magnetic north and by correlating his geographic location with the coordinates of his display.

The TADDS includes FM receiver A5, a data link processor and display group, and battery set A7. These are housed in a fiberglass case with handle and hinged cover.

A relief valve equalizes the pressure differential that may develop between the inside and outside of the case because of changes in altitude or temperature.

The cover contains map storage clamps, a magnetic compass, a telescoping antenna, an antenna adapter, a battery charging cable, a marking pencil, an antenna tuning chart, and an interlock striker plate. The interlock turns the display set power off when the cover is closed. The antenna ground plane is connected to the FM receiver and coiled around the clamps in the cover.

FM RECEIVER

The receiver receives frequency-modulated (FM) transmissions and contains a frequency synthesizer. It receives target data or voice transmissions from the radar set in the frequency band of 30.00 to 75.95 megahertz (MHz).

A speaker is incorporated in the FM receiver. This allows the operator to hear data tone bursts or voice transmissions which will aid him in evaluating message quality, relative signal strength, radio frequency interference (RFI), and electronic countermeasures (ECM). The speaker also reproduces an audible alarm tone at 1500 Hz to alert the operator whenever the data link signals are absent or incorrect, or new data is received.

The front panel controls include: four frequency selection switches, and a volume control which turns on power, adjusts the audio level of the data tone bursts or voice transmissions, and provides squelch control. The front panel is also provided with a connector for the telescoping antenna and adapter.

DATA LINK PROCESSOR AND DISPLAY GROUP

The data link processor and display group includes four printed circuit cards (A1-A4) and the data display matrix (A6).

TARGET ALERT DATA DISPLAY SET (TADDS) – Continued

The printed circuit cards are inserted in a connector mounting frame and are not accessible to the operator or organizational maintenance technician.

The data display matrix consists of 49 indicator groups. Within each indicator group there are two indicator discs that are electro-magnetically actuated. One disc is fluorescent orange on one side, denoting a foe and black on the other side, denoting no indication. The other disc is fluorescent green on one side, denoting a friend, and black on the other side. The data display matrix has a transparent plastic window. This window is engraved with a 7 by 7 grid that separates the 49 indicator groups. The operator can mark information showing the location and orientation of the air defense weapon emplacement and aircraft on the window with the marking pencil.

BATTERY SET

The battery set is composed of a rechargeable, nickelcadmium battery, and an attached cable and connector. The assembly is contained in a separate compartment of the TADDS case accessible from the underside of the case.

TADDS OPERATOR CHECKS AND ADJUSTMENTS

Note

If any of these checks can not be successfully completed, notify organizational maintenance.

BATTERY VOLTAGE CHECK

This check is done before operation and periodically when TADDS is in storage. If battery failure occurs during operation, use the battery charging cable (4) to hook up to an external 24 vdc supply.

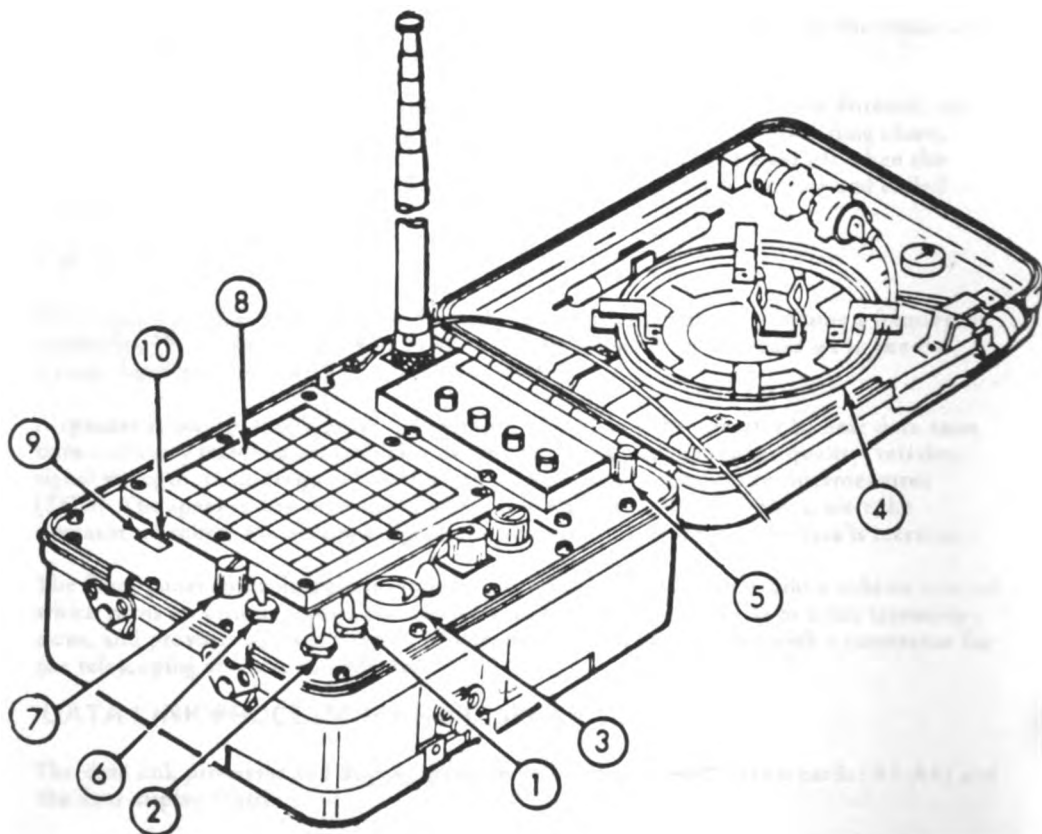
1. Set PWR switch (1) to ON.
2. Set and hold switch (2) to BAT AND RESET.
3. SIG AND BAT meter (3) should indicate between 0.5 and 0.7.

0.7 means battery is fully charged.

0.63 means you should perform the battery voltage check **periodically** during operation.

0.59 means no more than two hours of operating time remaining.

Less than 0.59 means battery should be recharged or replaced.



TADDS OPERATOR CHECKS AND ADJUSTMENTS – Continued

DATA LINK PROCESSOR AND DISPLAY GROUP SELF TEST CHECK

This test verifies the operational readiness of the TADDS excluding the receiving capability of the FM receiver. Signals are generated by the self test circuitry instead of the FM receiver. These signals are sequenced and fed to the normal operating circuitry.

- 1 To prepare for test, position switches and controls as follows:

PWR (1) to OFF.
VOL (5) fully clockwise (squelch off).
AUDIO ALARM (6) to READY.
AUDIO ALARM VOL (7) fully clockwise (cw).

- 2 Set PWR switch to ON. Hissing noise should be heard from speaker.

Note

If a message is being transmitted on the frequency to which the TADDS receiver is tuned, a tone burst will be heard.

- 3 Set BAT. AND RESET/SELF TEST switch (2) to SELF TEST position and release.
- 4 Observe the response to the TADDS indicators. Repeat step 3 as often as required to verify the normal indications listed below. The following sequence of indications should be observed. Indicators should shift without sticking.

A. Color sequence of friend/foe indicators in display matrix (8):

1. Left half and right half black.
2. Left half color (top to bottom sequence).
3. Right half color (top to bottom sequence).
4. Left half erase (top to bottom sequence).
5. Right half erase (top to bottom sequence).
6. Left half no data displayed.

B. Color sequence of DATA INPUT indicator (9) (black between steps):

1. Momentarily green before A. 2.
2. Momentarily green following A. 2.
3. Momentarily green following A. 4.
4. Continuously green following A. 6.

C. Audio alarm sequence:

1. Two alarm beeps before A. 2.
2. Third alarm beeps before A. 3.
3. Fourth alarm beeps before A. 5.
4. Fifth alarm beeps before A. 6.

D. Color sequence of NEW DATA indicator (10) (black between steps):

1. Momentarily orange before A. 3.
2. Momentarily orange before A. 5.

Set PWR switch to OFF.

TADDS OPERATOR CHECKS AND ADJUSTMENTS – Continued

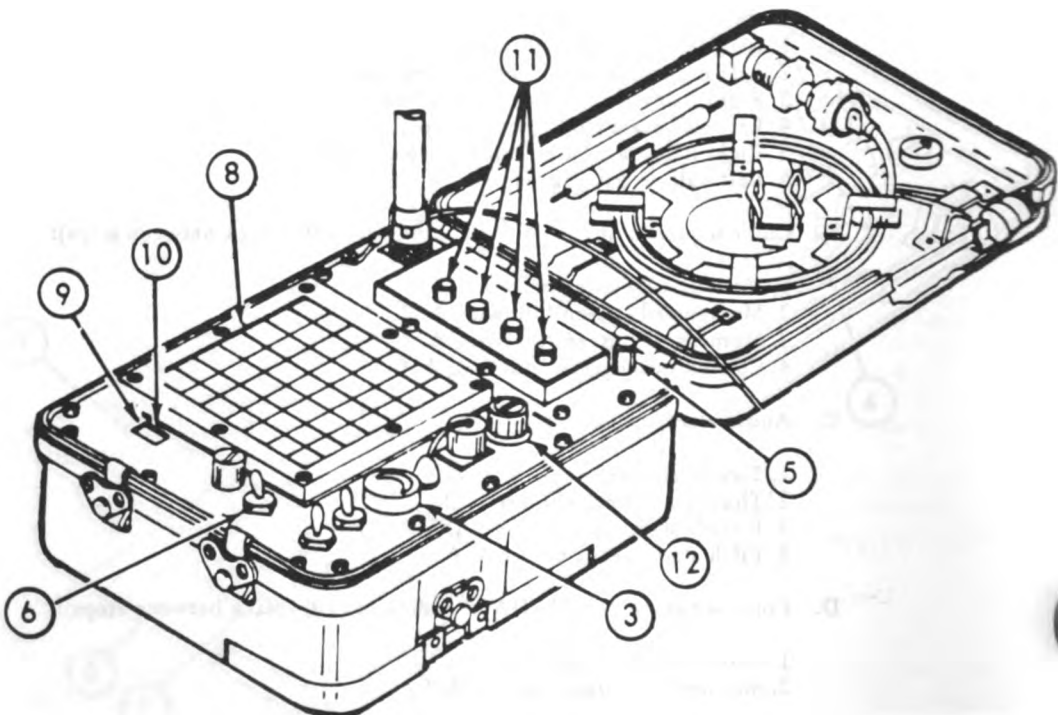
Note

If PWR switch is not set to the off position promptly, an audio alarm will sound within 2 seconds after completion of test sequence.

TADDS/RADAR OPERATIONAL CHECKS

In this check, a repetitive test sequence of four data words is transmitted to the TADDS over the RF data link. The purpose of this check is to verify the operation of the TADDS receiver and to insure that the TADDS can process new data.

1. To prepare for test emplace TADDS and position switches and controls as follows:
 FREQUENCY MHZ switches (11) set to designated frequency.
 ADDRESS CODE switch (12) to position corresponding to code in effect.
 ALARM switch (6) to READY.
 VOL control (5) to mid-range.
2. Set PWR switch to ON.
3. Using the intrasite communications link, request the radar operator to set the RFDL XMIT MODE switch to TEST. SIG AND BAT. meter (3) indicates a reading 0.3 to full scale.
4. Request the radar operator provide a voice check. You should get clear voice reception with good volume control.



TADDS OPERATOR CHECKS AND ADJUSTMENTS – Continued

5. Observe the following sequence of events. This sequence will repeat itself approximately every 6 seconds for as long as the RFDL XMIT MODE switch is in the TEST position.

Note

Steps F, and K, will occur only if the BAT AND RESET/SELF TEST switch is momentarily placed in the BAT AND RESET position. This must be done within 1.5 seconds after the alarm sounds.

- A. RFDL tone burst will be heard and will recur every 1.5 seconds.
 - B. DATA INPUT indicator (9) will show green.
 - C. All green indicators in left half of matrix (8) will show; all orange indicators will show.
 - D. NEW DATA indicator (10) will show orange.
 - E. Audio alarm will sound.
 - F. NEW DATA indicator (10) will show black and audio alarm will stop (see note above).
 - G. DATA INPUT indicator (9) will show black.
 - H. All green indicators in right half of matrix will show; all orange indicators will show.
 - I. NEW DATA indicator (10) will show orange.
 - J. Audio alarm will sound.
 - K. NEW DATA indicator (10) will show black and audio alarm will stop (see note above).
 - L. DATA INPUT indicator (9) will show green.
 - M. All indicators in left half of matrix (8) will show black.
 - N. DATA INPUT indicator (9) will show black.
 - O. All indicators in right half of matrix (8) will show black.
 - P. Normal indicators A. through L. will repeat until radar operator terminates test.
6. Set PWR switch (1) to OFF.
 7. Disconnect antenna and adapter and store in the TADDS cover.

TADDS OPERATOR CHECKS AND ADJUSTMENTS – Continued

BATTERY CHARGING CIRCUIT CHECK

This test is done before charging the battery. It is done to make sure the battery charging circuit is functioning correctly.

1. Set PWR switch (1) to OFF.
2. Open battery compartment cover and remove battery set.
3. Remove charging cable (4) and connect to 24 VDC connector (13).

CAUTION

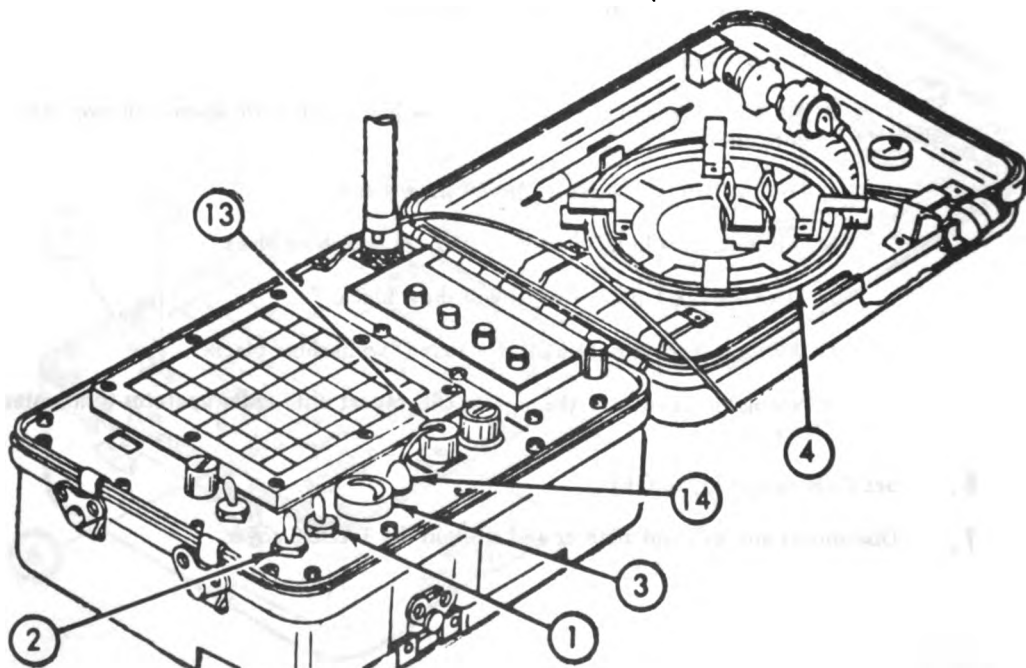
Don't connect cable unless PWR switch is off.

4. Connect charging cable alligator clips to any 24 vdc source. Observe polarity, red sleeve to positive terminal and black sleeve to negative terminal. CHARGE LIGHT indicator (14) should light.
5. Set PWR switch (1) to ON.
6. Set and hold switch (2) to BAT AND RESET. SIG AND BAT meter (3) should read above 8 volts.

Note

In most cases the meter will peg to 12 volts.

Test is done. Release switch (2). Set PWR switch (1) to OFF. Disconnect, remove, and store the charging cable (unless you're going to charge the battery).



TADDS OPERATING PROCEDURES

For best receiving conditions, select a site for the TADDS which allows a clear line-of-sight to the radar unit. You usually won't be able to do this. But at least try to pick a site with no nearby obstructions to the imagined line-of-sight. Keep away from interference such as generators or transmitters. Emplace TADDS while listening to speaker noises with receiver volume turned fully clockwise and pick a site where reception is best. If it is necessary to increase sensitivity, use the antenna ground plane.

CAUTION

Do not emplace the TADDS within 30 feet of any antenna capable of radiating 75 watts as the FM receiver may be damaged. For antennas capable of radiating more than 75 watts increase the distance.

ORIENTATION OF TADDS

1. Using weapon system compass, rotate compass until arrow aligns with north line marking on compass dial.
2. Rotate TADDS so that longitudinal axis points in magnetic north-south direction with top of data display matrix at north.

NOTE

Make certain compass is not influenced by nearby magnetic metallic objects.

3. Using grease pencil, place a mark in the center display square to signify the radar's location.
4. Using grease pencil, place a mark on the display square which corresponds to fire unit location.

ANTENNA INSTALLATION

1. Remove antenna and coupler from TADDS cover.
2. Attach coupler to ANT connector on TADDS FM receiver.
3. Screw antenna into the coupler.
4. Extend antenna sections to correspond to the frequency selected as given on the antenna tuning chart located in TADDS cover.

NOTE

Use larger antenna sections first. Erected antenna should have a smooth appearance...no steps, meaning only largest and smallest sections were extended.

NOTE

The ground plane consists of four cables (radial arms) which may be needed to increase received signal strength under marginal conditions. If required, they should be deployed away from the TADDS so that they are approximately 90° from each other.

NOTE

If TADDS is closer than 260 yards to the radar unit, do not install antenna on to coupler.

TADDS OPERATING PROCEDURES – Continued

OPERATING PROCEDURES

1. Controls, indicators and connectors are shown on opposite page.
2. Because the TADDS is a passive device used to display tactical information, no detailed operating instructions are provided in this manual...Refer to FM 44-6 and TM 9-1430-589-12.
3. Observe following cautions:

CAUTION

Take care of the battery...no sustained operation above 122°F or below -40°F...when TADDS has been operated from an external power source, extend battery charge time next time battery is charged. Don't charge the battery with temperatures either above 122°F or below 32°F.

If operating the TADDS within 260 yards of the radar set, reduce the input to the FM receiver by either detuning or removing antenna.

Do not operate the TADDS within 30-foot distance of transmitters operating at 75 watts power output. Increase the separation for transmitters with power outputs greater than 75 watts.

EMERGENCY OPERATION WITH BATTERY FAILURE

If TADDS battery fails to provide adequate voltage the TADDS can be maintained operational by using an external 24 V battery as a voltage source. Proceed as follows:

CAUTION

When operating the unit from an external source at temperatures below 32°F, the TADDS battery may be damaged. Inspect the battery after this type of operation. If there is moisture on the battery jacket or the jacket appears to bulge this is an indication that electrolyte has leaked from the cells. Replace the battery and clean the battery compartment.

1. Set PWR switch (1) to OFF.
2. Connect battery charging cable (4) to connector (13).
3. Connect charging cable alligator clips to external 24 vdc source. Observe polarity, red sleeve to positive terminal and black sleeve to negative terminal.
4. Set PWR switch (1) to ON.

TADDS OPERATING PROCEDURES – Continued

FREQUENCY-MHz SWITCH

Frequency selection is controlled by four switches, keys 1, 2, 3, and 4, (tens, units, tenths and hundreth digits) of the receiver frequency in MHz. Frequency range is 30.00 through 75.95 MHz. Mechanical stops prevent settings outside this range.

Frequency selection is controlled by four switches, keys 1, 2, 3, and 4, (tens, units, tenths and hundreth digits) of the receiver frequency in MHz. Frequency range is 30.00 through 75.95 MHz. Mechanical stops prevent settings outside this range.

Data display Matrix
Indicates aircraft location and friend or foe status

NEW DATA indicator
Alerts operator when new data is received

DATA INPUT indicator
Informs operator of reception and processing of the RFDL message

AUDIO ALARM VOL control
Adjust volume of alarm

AUDIO ALARM switch
Turns alarm on or off

ANT Connector A5J1

COMPASS
Used to orient display set to magnetic North

Power interlock
Sets PWR switch to OFF when cover is closed

VOL CONTROL
Controls voltage and sets squelch

ADDRESS CODE switch
Selects address code

24 VDC connector J1
For battery charging cable

CHARGE LIGHT indicator
Lights when battery is being charged

SIG AND BAT meter
Indicates signal strength of received data or battery voltage

PWR switch
turns TADDS on or off

BAT AND RESET SELF TEST switch
BAT AND RESET position applies battery voltage to SIG AND BAT meter; resets audio alarm, and resets NEW DATA indicator

Center position applies battery voltage to SIG AND BAT meter

SELF TEST position initiates self test sequence

SECTION IV.

OPERATING UNDER UNUSUAL CONDITIONS

2-20 General. When operating under unusual conditions, extra care must be taken of certain things and there are additional tasks to be done. The DOs and DON'Ts that follow are important. They must be observed so that you and your equipment will perform properly.

OPERATING IN EXTREME COLD (0° to -65°F)

2-21 General. Extreme cold thickens lubricants, cracks insulation, and makes materials easier to damage. In addition to complete winterization and good maintenance, the following DOs and DON'Ts will keep your gun system operating in rugged arctic weather.

DOs AND DON'Ts IN EXTREME COLD

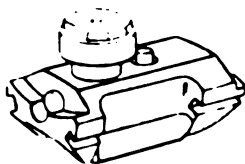
DOs

1

DO your
Before Operation
PMCS

2

DO - Clean and lubricate breech bolts according to LO 9-1005-318-13.



3

DO - Notify organizational maintenance to reposition battery taps if necessary (page 2-23).

4

DO - Be aware of the way cold weather affects your gun system.

5

DO - Cover ends of telescopes to protect from snow and ice.

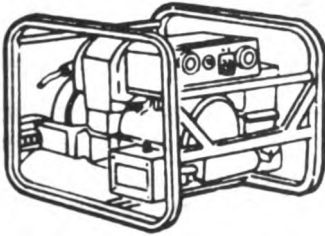
6

DO - Cover cannon when not in use.

OPERATING IN EXTREME COLD – Continued

DOs – Continued

7



DO – Make sure oil in crankcase of the APU engine has been changed to grade OES when operating below 0°F.

DO – Run APU 15 minutes before applying load to unit.

DO – Operate the APU for 1 hour to preheat batteries when the temperature is between 32°F and -40°F. The APU should be operated for 2 hours to preheat batteries when temperature is between -40°F and -65°F.

8

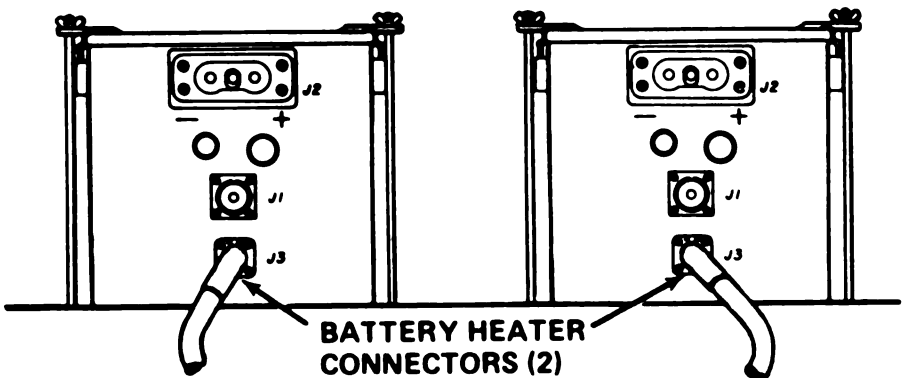
DO – Clean off all snow, ice, and mud as soon as possible after operating or after traveling.

9

DO – Allow the fire control system to warm up. Operate in standby for 15 minutes between 32°F and -40°F and for 30 minutes between -40°F and -65°F.

10

DO – Make sure battery heaters are connected. Make sure battery holdowns are tight and batteries secure.



11

DO – “After operation procedures” (PMCS)

OPERATING IN EXTREME COLD – Continued

DON'Ts

1

DON'T – Touch bare metal or fuel with hands-wear gloves.

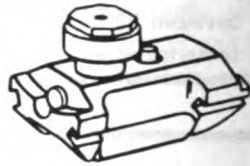
2

DON'T – Expose sight and fire control instruments to sudden temperature changes.

3

DON'T – Breathe on optical surfaces. Condensation will freeze.

4



DON'T - Over Lubricate breech bolts (page 2-106).

END

OPERATING IN EXTREME HEAT

2-22 General. Rust and fungus thrive in hot humid weather. Materials dry and crack and battery liquid and oil evaporate faster. Special care will ensure dependable operation of your vehicle in extreme heat.

DOs AND DON'Ts IN EXTREME HEAT

DOs

1

**DO your
Before Operation
PMCS**

2

DO - Lubricate assemblies and mount bearing according to LO 9-1005-318-13.

3

DO - Park gun under cover from sun or use tarps if shelter is not available.

4

DO - Store and operate APU in a shaded location when possible. Allow free flow of air around unit (see TM 5-6115-323-14).

5

DO - Make frequent inspections and clean and lubricate to prevent deterioration. See Lube Order.

6

DO - Protect fire control system from direct rays of sun as much as possible.

7

DO - Keep sun off ammo.

8

DO - Notify organizational maintenance to check the level of the electrolyte in the battery cells daily.

WARNING



DO NOT - Smoke, handle ammo, wear rings, or drop tools when checking batteries.



DON'Ts

DON'T - Fill APU fuel tank completely - allow for expansion of fuel.

END

OPERATING IN DUSTY OR SANDY AREAS

2-23 General. Blowing dust and sand will erode external finishes and affect your gun in other ways. Sand mixed with grease and oil forms a grinding agent that will cause failure of moving parts. Dust and sand are enemies of your gun system.

DOs AND DON'Ts IN DUSTY OR SANDY AREAS

DOs

1 **DO your Before Operation PMCS**

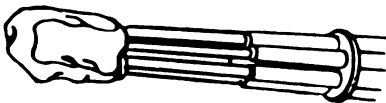
2 DO – Lubricate completely to force out contaminated lubricants (see LO 9-1005-318-13).

3 DO – Park under shelter and install traveling cover when gun is not to be used for an extended period of time.

4 DO – Make sure only a thin film of oil is on breech bolt assemblies before operating cannon.

5 DO – Clean APU air cleaner and fuel filter daily. (See TM 5-6115-323-14.)

6 DO – Use muzzle cover when cannon is not in use.



7 DO – Touch up paint damaged by blowing sand.

8 DO – Protect sight and telescopes from sand.

9 DO – Provide wind shield and keep area around APU free of dust and sand. Wet area down if possible. (See TM 5-6115-323-14.)

10 DO – Cover radar antenna when not in use.

OPERATING IN DUSTY OR SANDY AREAS – Continued

DON'Ts

1 **DON'T** – Drive prime mover with gun through soft, sandy, or dusty areas if you can take a hard, solid route.

2 **DON'T** – Over lubricate

END

OPERATING UNDER RAINY OR HUMID CONDITIONS

DOs AND DON'Ts UNDER RAINY OR HUMID CONDITIONS

2-24 General. Unless precautions are taken, dampness will corrode and damage equipment. This action is accelerated during rainy season or in humid climates. Electronic and electrical equipment can be severely affected. Driving conditions can become dangerous.

DOs

1
DO your
Before Operation
PMCS

2 **DO** – Clean mud from all parts as soon as possible after traveling. Lubricate according to LO 9-1005-318-13.

3 **DO** – Keep APU fuel tank full - prevents condensation.

4 **DO** – Keep equipment dry. Install system covers (and tarps if available) during rain. Lift, or open covers as soon as possible to allow ventilation. Check with organizational maintenance for methods of drying exposed equipment.

6 **DO** - Coat cannon barrel muzzle clamp with cleaner, lubricant (LAW-AW (item 21A, appendix D).



5 **DO** -- Remove carriage drain-plug and keep outlet clear of obstructions.

7 **DO** - Remove corrosion from metal surfaces with rag (item 26, appendix D) or abrasive paper (item 22, appendix D). Apply cleaner, lubricant LAW-AW, (item 21A, appendix D).

OPERATING UNDER RAINY OR HUMID CONDITIONS – Continued

DOs CONTINUED

8 DO – Erect a shelter to protect the APU. If no shelter, cover with canvas. Remove cover during dry periods.

9 DO – Keep insects out of system. They cause shorts with bodies and damp webs.

DON'Ts

1 DON'T – Fold wet canvas. Dry out if possible.

2 DON'T – Make sharp turns in mud with prime mover.

END

**DOs AND DON'Ts
IN SALT WATER AREAS**

2-25 General. Rust thrives in salt water areas. Special care will ensure dependable operation of your equipment in salt water areas.

DOs

1
**DO your
Before Operation
PMCS**

2 DO - Lubricate breech bolt assemblies and mount bearing according to LO 9-1005-318-13.

3 DO -- Call organizational maintenance when exposure extends beyond normal crew maintenance.

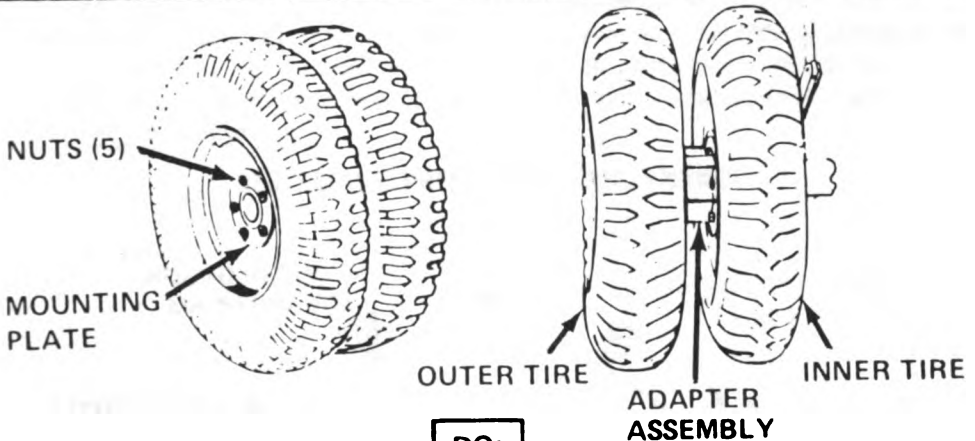
DON'Ts

1 DON'T – Use water under pressure to wash the gun system.

2 DON'T – Allow rust to build up on your gun system.

END

OPERATING WITH ONE OR TWO FLAT TIRES

DOs AND DON'Ts FOR OPERATING WITH LESS THAN FOUR FULLY-INFLATED TIRES**DOs****1**

DO your
Before Operation
PMCS

2

DO - Check tire pressure before operation.

3

DO - Operate on properly inflated inner tire when outer tire is flat.

4

DO - Move properly inflated outer tire to inside when inner tire is flat.

5

DO - Mount properly inflated tires on inside when operating with only two wheels. Use mounting plate and nuts to mount wheels; leave adapter assembly off.

DON'Ts**1**

DON'T - Overinflate tires.

2

DON'T - Operate on hard surfaces with under-inflated tires.

3

DON'T - Operate at speed in excess of 72 Kmh (45 MPH).

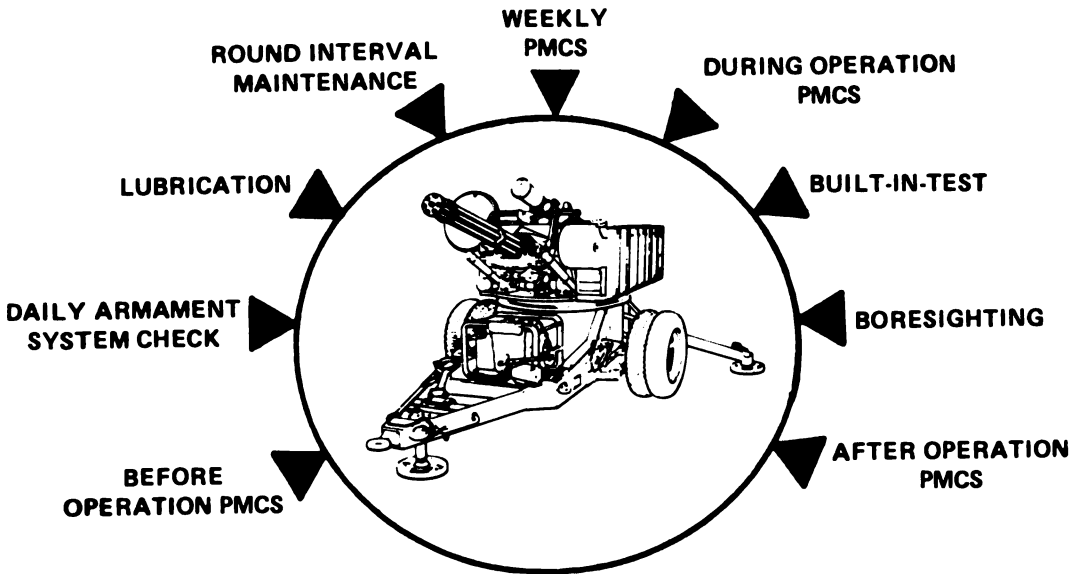
END

CHAPTER 3

MAINTENANCE INSTRUCTIONS

3-1 Introduction. This chapter contains preventive and corrective maintenance procedures that are required to keep your M167A2 serviceable and ready for action. It is your responsibility to perform the following instructions. The maintenance procedures for auxiliary equipment are contained in chapter 4.

SYSTEMATIC PREVENTIVE MAINTENANCE

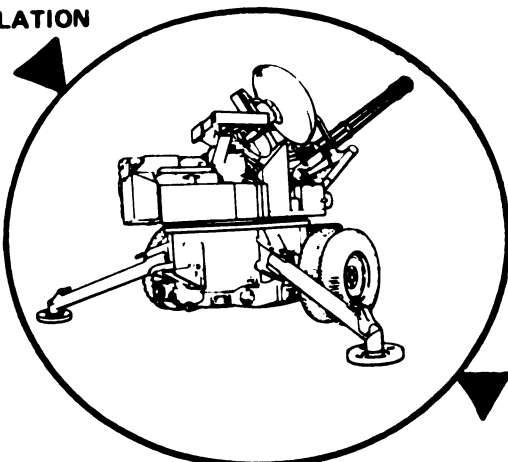


PROCEDURE INDEX

PROCEDURE	PAGE
AFTER OPERATION PMCS	3-3
BEFORE OPERATION PMCS	3-3
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DAILY ARMAMENT SYSTEM CHECK	3-23
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CORRECTIVE MAINTENANCE

FAULT ISOLATION



FAULT CORRECTION

SECTION I . TOOLS AND EQUIPMENT

Tools and equipment issued for use in maintaining the system are listed and illustrated in Appendix B. Use only the tools that are provided and make sure they fit properly. Do not use tools or equipment for purposes other than those prescribed. Make sure tools and equipment are stored properly when not in use. Storage locations are given in Appendix E.

A tilted image of a DA Form 117, 'Equipment Maintenance Record'. The form contains fields for 'Name of Equipment', 'Serial Number' (with the number 627372 visible), 'Location', 'Date', and 'Remarks'. It is designed for tracking the maintenance history of specific equipment.

SECTION II . FORMS AND RECORDS

The Department of the Army forms and procedures used for equipment maintenance will be those described by DA PAM 738-750. Your system logbook contains a collection of DA forms that are described in DA PAM 738-750. These forms must be kept up to date. You must make an appropriate entry on the applicable DA Form as soon as possible after completing any maintenance action, including firing or cycling rounds. The logbook is a maintenance record of your M167A2 system and should always reflect its current status.

A tilted image showing a stack of DA forms. The top form is clearly DA Form 117, 'Equipment Maintenance Record', which is used for recording maintenance actions on equipment. The stack suggests multiple forms are available for use in the logbook.

SECTION III . LUBRICATION

3-2 Lubrication and Service Intervals. Consult LO 9-1005-318-13 for lubrication and service intervals. This tells you when and what to lubricate and the type of lubrication to use. Requisitioning information regarding lubricants can be found in Appendix D.

3-3 Lubrication During Unusual Conditions. Lubricants can quickly lose their protective qualities when exposed to extremely high or low temperatures, dust, sand, moisture. Prolonged high-rate operation can also break down lubricants. Lubricate more often to compensate for these unusual conditions. Lubrication intervals may be extended during inactive periods.

SECTION IV . PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-4 General. At the specified intervals, the applicable PMCS listed in table 3-1 will be performed. Before you begin the PMCS, keep in mind the following general information which is just as important as the specific checks.

- a. BEFORE YOU OPERATE: Always keep in mind the WARNINGS and CAUTIONS. Perform your before operation (B) PMCS.
- b. WHILE YOU OPERATE: Always keep in mind the WARNINGS and CAUTIONS. Perform your during operation (D) PMCS.
- c. AFTER YOU OPERATE: Be sure to perform your after operation (A) PMCS.
- d. IF YOUR EQUIPMENT FAILS TO OPERATE: Troubleshoot with proper equipment. Report any deficiencies which cannot be corrected on DA Form 2404.

GENERAL PROCEDURES

The following general procedures apply to crew preventive maintenance services and to all inspections and are just as important as specific procedures.

3-5 Inspection. Inspection is necessary to see if items are in good condition, correctly assembled or stored, secure, not excessively worn, not leaking, and adequately lubricated applies to most items in the preventive maintenance checks and services. Any or all of these inspections that are pertinent to any item (including supporting, attaching, or connecting members) should be performed in addition to any specific procedures given.

IMPORTANT: Before using dummy rounds, always clean and inspect for damage. Also check the ammo links. Burred and dirty dummy rounds can cause excessive wear and damage.

- a. Inspect for good condition.
 - Visually inspect for damage beyond safe or serviceable limits.
- b. Inspect for correct assembly and stowage.
 - Visually inspect for improperly assembled or stowed items.
- c. Inspect for security.
 - Visually inspect or check by hand, wrench, or prybar for looseness.
- d. Inspect for wear.
 - Visually inspect or check by hand for items worn beyond serviceable limits. Also check for applicable markings, data, caution plates, and printed matter that are illegible.

NOTE

Where the instruction "tighten" appears in a procedure, tighten with the appropriate tool, even if the item seems to be secure.

3-6 Cleaning precautions.

- a. Dry cleaning solvent evaporates quickly and has a drying effect on skin. If used frequently without gloves, cracks in the skin and mild irritation or inflammation of the skin may result.
- b. Do not get dry cleaning solvent, engine fuels, or lubricants on rubber parts. Rubber is not resistant to petroleum products and will deteriorate when exposed to them.

GENERAL PROCEDURES – Continued

3-7 Cleaning. Any special cleaning instructions required for specific components or parts are contained in the pertinent section. General cleaning instructions are as follows:

WARNING



Dry cleaning solvent is flammable and should not be used near an open flame. Fire extinguishers should be nearby when these materials are used. Use only in well ventilated places. The use of diesel fuel oil, gasoline, or benzine (benzol) is prohibited for cleaning purposes.



- a. Use dry cleaning solvent (SD-2, item 2, appendix D) to clean all unpainted metal parts.

IMPORTANT: DO NOT clean interior or exterior of upper carriage with steam, water, or air under pressure.

- b. Dry cleaning solvent (SD-2, item 2, appendix D) may be used for dissolving grease and oil. After cleaning, use cold water to rinse off solution. See paragraph 3-6.

- c. After parts are cleaned, rinse and dry thoroughly with a clean rag (item 26, appendix D). Apply dry cleaning solvent SD-2 (item 2, appendix D) to all unprotected metal surfaces (other than optical instruments) to prevent rusting.

- d. When installing authorized new parts, remove any preservative materials, such as rust preventive compound, grease, etc. If parts require lubrication, refer to LO 9-1005-318-13.

- e. To prevent the formation of mildew, shake out and air fabric covers for several hours at frequent intervals. Make immediate repairs of minor damage. Mildewed fabric is best cleaned by scrubbing with a dry brush. If water is necessary to remove dirt, the water must not be used until all mildew has been removed. If fabric shows no indication of rotting or weakening, the canvas can be retreated.

GENERAL PROCEDURES – Continued

f. If metal name plates, caution plates, and instruction plates are corroded clean thoroughly and coat with lubricating oil, general preservative, PL-M (item 19, appendix D).

g. Clean telescope lens with lens paper (item 23, appendix D).

3-8 Painting. Touch up paint in accordance with TB 43-0209.

3-9 Specific Procedures. Specific preventive maintenance to be performed on the system is listed in tables 3-1 through 3-3. When performing these services, you must enter the item number and the malfunction which is beyond your scope of repair in accordance with the requirements of DA PAM 738-750.

3-10 Column entries used in PMCS.

a. Column 1 - The "ITEM NO" Column lists the checks and services to be performed in chronological order. It is also used as an item number source for the "TM NUMBER" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS. An asterisk before the item number indicates a special interval required by adverse conditions. A letter following the item number referred to information noted at the bottom of the page.

b. Column 2 - The "INTERVAL" column lists the specific intervals at which the PMCS will be performed. They are as follows:

- B - Before operation
- D - During operation
- A - After operation
- W - Weekly
- M - Monthly

c. Column 3 - The "ITEM TO BE INSPECTED" column identifies the system item to be check or serviced and the procedure for performing the check or service.

d. Column 4 - The "EQUIPMENT NOT READY/AVAILABLE IF:" column contains the criteria which will render the system incapable of performing its primary mission. The terms "ready/available" and "mission capable" refer to the same status - the equipment is on hand and is able to perform its combat mission. (See DA PAM 738-750.)

Table 3-1. Preventive Maintenance Checks and Services

B - BEFORE
OPERATIOND - DURING
OPERATIONA - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
1	•		•			<p>M167A2 SYSTEM</p> <p>Be alert during your PM checks for unusual noises or odors that might indicate something is wrong.</p> <p>GENERAL</p> <p>NOTE</p> <p>Lubricate in accordance with LO 9-1005-318-13.</p> <p><u>System Log Book.</u></p> <p>Determine status of system.</p>	

Table 3-1. Preventive Maintenance Checks and Services - Continued

FORE OPERATION D – DURING OPERATION A – AFTER OPERATION W – WEEKLY M – MONTHLY

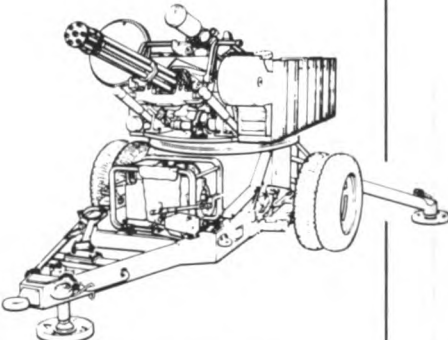
INTERVAL						ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
B	D	A	W	M			
						<p>CARRIAGE</p> <p><u>General.</u></p> <p>Make a walkaround inspection of lower carriage checking components for damage or misalignment. Manually rotate the mount 360 degrees and elevate to +80 degrees to ensure that nothing will interfere with movement of the upper carriage and cannon. Check slip ring latch and cover for damage. Make sure latch is engaged. Check inclinometer and its cover for cracks, looseness, and damaged or missing parts.</p> 	<p>Major components missing or damaged.</p> <p>Carriage mount will not rotate and/or cannon will not elevate. Erratic movement during elevating or depressing cannon. Erratic mount movement. Slip ring latch cover is damaged.</p>
						<p>Check seat adjustments.</p> <p>Inspect the carriage for cracked frame or broken weld.</p>	<p>Seat is missing</p> <p>If frame is cracked or weld broken.</p>

Table 3-1. Preventive Maintenance Checks and Services - Continued

B — BEFORE OPERATION D — DURING OPERATION A — AFTER OPERATION W — WEEKLY M — MONTHLY

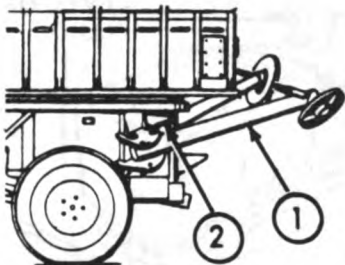
ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
3	•		•			 <p><u>Suspension System.</u></p> <p>Make sure outriggers (1) and locking pins (2) are clear of obstructions such as mud or ice. If lower carriage is resting on wheels, pull outrigger pins and check outriggers for freedom of movement. Place front drop pad alternately in firing and traveling positions.</p> <p>Alternately place the running gear in firing and traveling positions and lock it in each positions.</p> <p>Check tires and wheels for tread depth of more than 1/8". If depth is 1/16" or less, replace tire. Check wheels for bends or damage.</p> <p>Check wheels for missing or loose lug nuts and studs.</p>	<p>Arm assembly inoperative. Drop pad cannot be lowered or retracted.</p> <p>Right or left axle arm assembly broken or inoperative. Lock pin cannot be retracted or placed in travel position.</p> <p>One tire is flat or unserviceable. Wheels are bent or damaged to the extent they affect towing.</p> <p>Two or more of the lug nuts or studs are missing.</p>

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY

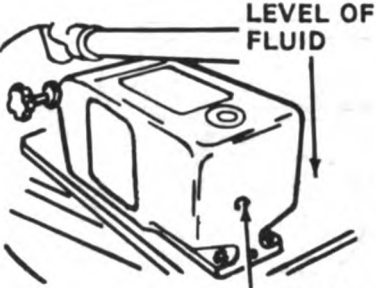
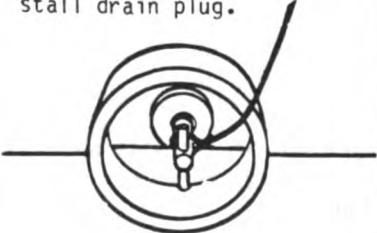
ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
4	•		•			<div><p>LEVEL OF FLUID</p><p>1/4" PIPE PLUG</p><p><u>Hydraulic Fluid.</u></p><p>This check can only be made when system is resting on wheels and carriage is approximately level. Check hydraulic fluid by removing 1/4" plug from end of reservoir. Fluid level should be up to plug hole.</p><p>Before replacing plug, apply tape (MIL-T-27730, item 27 appendix D) to threads. Operate the hydraulic system and check for proper function and leaks.</p></div>	System cannot be raised or lowered.
5	•		•			<div><p><u>Drain Plug.</u></p><p>Remove drain plug and drain all water. Reinstall drain plug.</p></div>	

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY

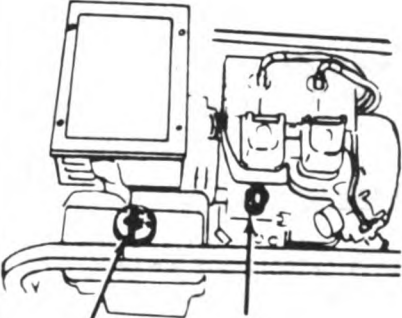
ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
6	•		•			<p>ARMAMENT AND RADAR</p> <p><u>APU.</u></p> <p>Check level of gas and oil with engine shut down.</p> <p>Oil operating level should be between "ADD" and "FULL".</p> <p>Check cables and connectors for serviceability.</p> <p>Operate the APU to determine condition.</p> 	<p>Cables or connector unserviceable; engine will not start. No generator output. Load switch will not turn on, or variable resistor inoperative.</p>
7				•		<p>GAS OIL</p> <p><u>Low Voltage.</u></p> <p>Turn SYSTEM POWER to ON. Uncage sight. Set MODE switch to RADAR. Hold LOW VOLTAGE switch to TEST. LOW VOLTAGE WARNING indicator flashes for approximately 4 seconds, then stays lit. Radar deenergizes. Set LOW VOLTAGE switch to NORMAL. Cage sight. Set SYSTEM POWER to OFF. Wait approximately 4 seconds, then set SYSTEM POWER to ON. Uncage sight.</p>	<p>Radar will not shut down.</p>

Table 3-1. Preventive Maintenance Checks and Services - Continued

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION W – WEEKLY M – MONTHLY

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
8	•					<p><u>BALLISTICS/BIT VALUE</u> <u>Display Lamps.</u></p> <p>Set BALLISTICS/BIT FUNCTION switch to LT. Check that all incandescent lamps are lit.</p> <div></div> <p>Cage sight. Set SYSTEM POWER to OFF.</p>	All 3 lamps not lit in any lamp segment.
9	•					<p><u>Batteries.</u></p> <p>Check exterior of battery case for cleanliness and damage. Make sure cable connectors are clean and secure.</p> <div></div>	One battery missing or unserviceable.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATIOND - DURING
OPERATIONA - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
10				•		<u>M61A1 Sight.</u> Clean and inspect (page 3-146).	
11				•		<u>M134 Straight Telescope.</u> Clean and inspect (page 3-5). ARMAMENT	
12			•	•		<u>Barrels.</u> a. Check barrels for cracks and bulges. b. Determine remaining round life. Check DA FORM 2408-4. (1) If 5000 rounds have been cycled or fired since last gage, notify organizational maintenance. (2) If 0.035 wear has been determined and 1500 rounds have been cycled, notify organ- izational maintenance. c. Clean and inspect (page 3-135). d. Lubricate according to LO 9-1005-318-13.	Barrels have cracks or bulges. Organizational maintenance determines wear is 0.050 or greater.

Table 3-1. Preventive Maintenance Checks and Services - Continued

BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY

INTERVAL						ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
B	D	A	W	M			
•						<p><u>Cannon and Feed System.</u></p> <p>Perform the following steps to verify timing between the cannon and feed system:</p> <p>a. Remove arming connector from firing interrupter (A7J2).</p> <p>CAUTION</p> <p>Do not hold BRAKE-CLEAR AND BRAKE switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.</p> <p>b. Hold BRAKE-CLEAR AND BRAKE switch to BRAKE; rotate cannon by hand until cannon timing pin can be engaged.</p> <p>c. Assure that feeder timing pin can be engaged to verify that timing exists between the cannon and the feeder.</p> <p>CAUTION</p> <p>Verify that both the cannon timing pin and the feeder timing pin disengage when released.</p> <p>d. Using 200 dummy rounds of ammunition, manually cycle 6 or more rounds through cannon and clear cannon.</p>	<p>Cannon does not rotate manually.</p> <p>Timing pin is missing or cannon and feeder timing pin cannot be engaged at the same time.</p> <p>Cannon and feeder fail to cycle and clear rounds.</p>

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY



ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
14						<p>e. Install arming connector.</p>  <p>WARNING</p> <p>DO NOT use live ammunition in the next step.</p>	<p>Arming connector is missing.</p> 
			•			<p>f. Refer to firing in the ground mode (page 2-80) and rotate cannon under power.</p> <p><u>AN/TVS-2B or AN/TVS-5 Night Sight.</u></p> <p>Clean and inspect (TM 11-5855-202-13 or TM 11-5855-214-10).</p>	<p>Cannon does not rotate under power.</p>
		•				<p><u>Azimuth Indicator and Gunner's Shield Lights.</u></p> <p>Check for operation.</p> <p>RADAR</p>	
16					•	<p><u>Interconnecting Cables.</u></p> <p>Check that all connectors are secure and check all cables for excessive wear, damage, or kinks. Check interconnecting waveguide for cracks and proper fastening at flanges. Check that RF gaskets are installed at cable connectors.</p>	<p>Any cable is missing or broken.</p>

Table 3-1. Preventive Maintenance Checks and Services - Continued

FORE D - DURING A - AFTER W - WEEKLY M - MONTHLY
OPERATION OPERATION OPERATION

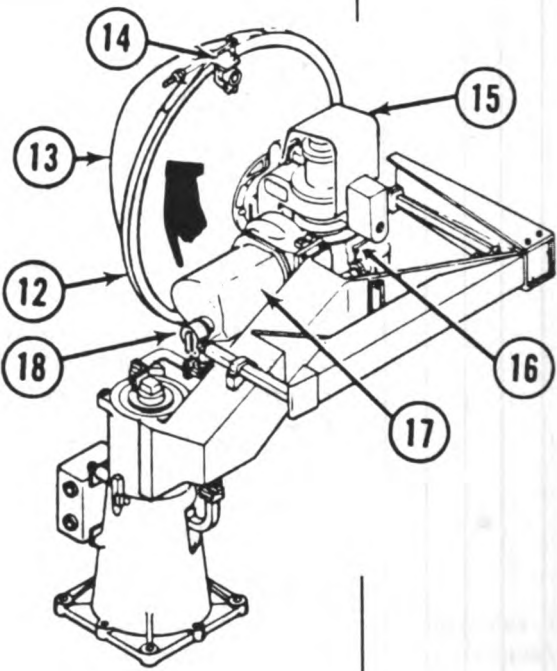
INTERVAL						ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
3	D	A	W	M			
						<div></div> <p><u>Antenna.</u></p> <div><div><p>a. Check reflector (12) for dents, holes, or other damage.</p><p>b. Check radome (13) for cracks, or loose hardware. Check lockwiring of draw latch handle.</p><p>c. Check boresight telescope bracket and clamps (14) for loose or damaged hardware.</p></div><div><p>a. Any dents or holes are present.</p><p>c. Any bracket or clamp is loose or damaged.</p></div></div>	

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
						<p>d. Check waveguide (15) for cracks and proper fastening at flanges.</p> <p>e. Check that covers on traverse servo drive (16) and elevation servo drive (17) are secure.</p> <p>f. Check that elevation input coupling clamps (18) and setscrews are not loose.</p> <p>g. Check stops, bumpers, and connectors for looseness or damage.</p>	<p>d. Waveguide has cracks or is not properly fastened at flanges. Damaged protective coating will not deadline system.</p> <p>f. Setscrews and clamps are loose and cannot be tightened.</p>

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATION

D - DURING
OPERATION

A - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

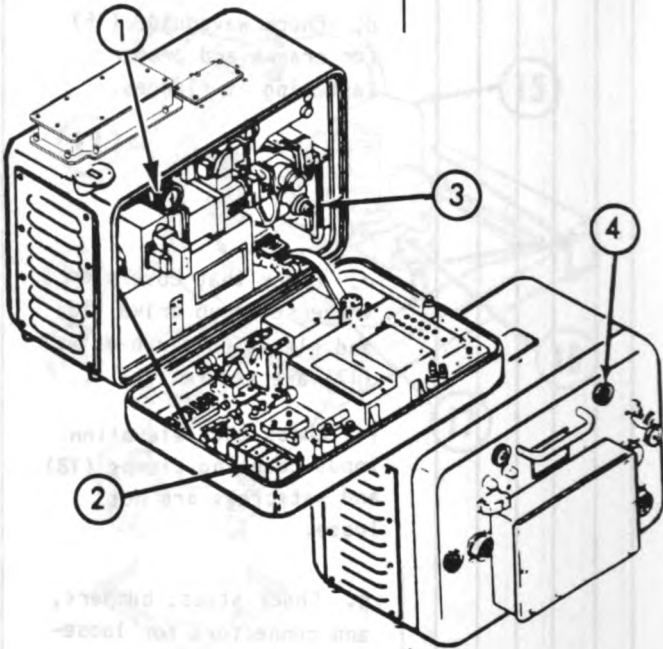
ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
18						 <p><u>Receiver-Transmitter.</u></p> <ol style="list-style-type: none"> Loosen thumbscrews under baseplate and wing fasteners, and remove cable guard from right side of system. Check inside for broken leads and cables. Check that tuning tool (1) is snug-tight in bracket. Check that crystals (2) are properly installed. 	<ol style="list-style-type: none"> Any lead or cable is broken. Tuning tool is missing. All crystals are missing.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATIOND - DURING
OPERATIONA - AFTER
OPERATION

W - WEEKLY

M - MON

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT NOT READY/AVA IF:
	B	D	A	W	M		
						<p>e. <u>IMPORTANT:</u></p> <p>Check that ventilators are unobstructed and allow free flow of air. Otherwise, failure due to overheating will occur.</p> <p>NOTE</p> <p>Clean air filter daily when operating in dusty or sandy areas.</p> <p>f. Clean air filter (3), page 3-148.</p> <p>g. Check that all thumb-screws (4) are snug-tight when front panel is closed.</p> <p>h. Install cable guard.</p>	

Table 3-1. Preventive Maintenance Checks and Services - Continued

FORE D - DURING A - AFTER W - WEEKLY M - MONTHLY
ERATION OPERATION OPERATION

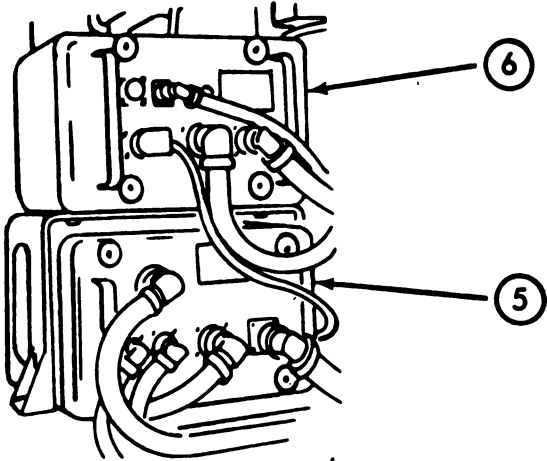
INTERVAL						ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
B	D	A	W	M			
						<div></div> <ul style="list-style-type: none">● <u>Receiver and Range Computer.</u> Remove cable guard on right rear of vehicle by pulling pin on each side and loosening thumbscrews under baseplate. Check exterior of receiver (5) and computer (6) for damage. Make sure all thumbscrews on receiver and computer are snug-tight. Install cable guard.	

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATION

D - DURING
OPERATION

A - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

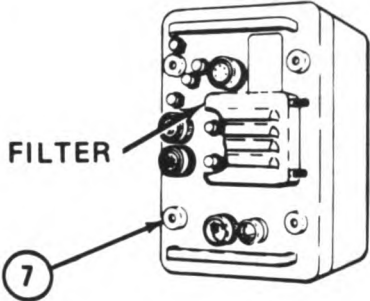
ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
20			•			 <p><u>Radar Power Supply.</u></p> <p>Remove cable guard on left rear of vehicle by pulling pin on each side and loosening thumbscrews under baseplate. Check exterior of power supply (7) for damage. Make sure all thumbscrews are snug-tight.</p> <p><u>IMPORTANT:</u></p> <p>Make sure that air intake and exhaust ports are unobstructed and allow free flow of air. Otherwise, failure due to overheating will occur. Install cable guard. Clean air filter (page 3-148).</p> <p>NOTE</p> <p>Clean air filter daily when operating in dusty or sandy areas.</p>	

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATIOND - DURING
OPERATIONA - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
21	•					<u>Armament System Check.</u> Perform the Daily System Armament Check (page 3-23).	System fails one or more checks.
22				•		<u>Boresight Procedure.</u> Perform boresight pro- cedure (page 3-74). This completes the preven- tive maintenance checks and services. Make entries in the log book that are required by DA PAM 738-750.	System cannot be boresighted.

END

SECTION V. DAILY ARMAMENT SYSTEM CHECK

3-11 General. Perform the Daily Armament System Check and Built-In-Test (tables 3-2 and 3-3) after completion of the Before Operation Preventive Maintenance Checks and Services (table 3-1). Successful completion of these checks and tests will prove the system operational. While performing the checks, watch for any abnormal indication. Notify organizational maintenance of faulty conditions that are beyond the repair capability of crew maintenance. Perform the checks in sequence, beginning with the Precheck Conditions. Consult the procedure index for procedures referenced in the checks and tests.

PROCEDURE INDEX

<u>PROCEDURE</u>	<u>PAGE</u>
APU	2-93
BUILT-IN-TEST (BIT)	3-27
FIRING INTERRUPTER	2-24
GROUND MODE	3-26
PRECHECK CONDITIONS	3-24
TROUBLESHOOTING	3-113
UNSTOWING RADAR ANTENNA	2-45

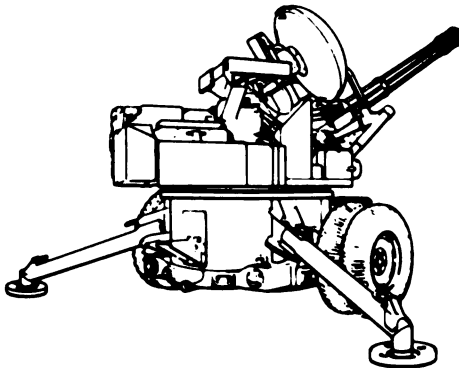


Table 3-2. Daily Armament System Check

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. PRECHECK CONDITIONS		
(1) Arming connector	Removed	
(2) Sight caging knob	Caged (fully CW)	
(3) LOW VOLTAGE switch	NORMAL	
(4) SYSTEM POWER switch	OFF	
(5) GUN POWER switch	OFF	
(6) RANGE IN METERS knob	500	
(7) TARGET SPEED IN KNOTS	0	
(8) GUN CLEAR switch	AUTO	
(9) BALLISTICS/BIT FUNCTION	OFF	
(10) DISPLAY/ENTRY switch	DISPLAY	
(11) Stow control MODE switch	NORM	
(12) Stow control MAINT switch	OFF	
(13) Distribution box circuit breakers	Reset (press in)	
(14) Power supply circuit breakers	Reset (press in)	
(15) NORM-STATIC-TEST switch	STATIC (middle)	
(16) Cannon	Unstowed	
(17) Azimuth and elevation drive brakes	ON	
(18) APU	Operating and adjusted for proper voltage	
(19) Control panel MODE switch	RADAR	
(20) Radar antenna	Unstowed	
(21) Gun brakes	ON	
(22) FAULT BYPASS switch	OFF (down)	

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
<p>2. SYSTEM POWER CHECK</p> <p>(1) Set SYSTEM POWER to ON and uncage sight.</p> <p>(2) Rotate SIGHT LAMP knob both ways from OFF.</p> <p>(3) Check fans in radar power supply and receiver-transmitter.</p> <p>(4) Unstow radar antenna.</p>	<p>SYSTEM POWER indicator and sight reticle lights immediately.</p> <p>LOW VOLTAGE WARNING indicator extinguished.</p> <p>Reticle intensity increases in both directions.</p> <p>Fans operating.</p>	<p>Troubleshoot (Upper Mount). Cage sight. Turn SYSTEM POWER to OFF then ON. Uncage sight. Troubleshoot (Sighting and Fire Control).</p> <p>Notify organizational maintenance.</p> <p>Troubleshoot (Sighting and Fire Control).</p> <p>Cage sight. Set SYSTEM POWER to OFF. Notify organizational maintenance.</p>
<p>3. FIRING INTERRUPTER CIRCUITS CHECK</p> <p>(1) Position the cannon at 0° elevation.</p> <p>(2) Open firing interrupter cover and pull the two rods closest to the arrow all the way out.</p> <p>(3) Turn GUN POWER to ON.</p>	<p>NO FIRE WHEN LIT indicator lights.</p>	<p>Check lamp.</p>

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
<p>WARNING</p> <p>Place NORM/STATIC/TEST switch to NORM and press ACQ/TRK switch prior to traversing the mount.</p> <p>(4) Traverse out of protected area.</p>	<p>NO FIRE WHEN LIT indicator goes out.</p>	<p>Notify organizational maintenance.</p>
<p>WARNING</p> <p>While operating in the RADAR, MANUAL, EXTERNAL or the TEST MODES, do not attempt to command the cannon in elevation after it has reached maximum elevation (contacted the mechanical stop). The turret will rotate unexpectedly at an uncontrolled rate until the action switches are released.</p>		
<p>(5) Elevate cannon to maximum elevation. Traverse through and back into protected area.</p>	<p>NO FIRE WHEN LIT indicator stays lit for approximately 40 degrees azimuth or 700 mils.</p>	<p>Notify organizational maintenance.</p>
<p>(6) Push the rods approximately 1/2 way back in.</p>	<p>NO FIRE WHEN LIT indicator goes out.</p>	<p>Notify organizational maintenance</p>
<p>(7) Reduce elevation slowly.</p>	<p>NO FIRE WHEN LIT indicator lights at approximately 45 degrees and remains lit.</p>	<p>Notify organizational maintenance.</p>

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
<p>(8) Set fire interrupter to 0 degree elevation (rods all the way in).</p> <p>(9) Set GUN POWER to OFF.</p> <p>(10) Clear system of all objects and personnel. Attempt to move turret without depressing the ACQ/TRK button.</p>	<p>Turret does not move.</p>	<p>Notify organizational maintenance.</p>
<p>4. GROUND MODE CHECK</p> <p>(1) Set MODE to GRD.</p>		
<p>(2) Traverse and elevate cannon.</p>		
<p>5. BUILT-IN-TEST</p> <p>Perform Built-In-Test.</p>	<p>No fault messages.</p>	<p>Troubleshoot (System Fault Messages).</p>

END

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. GROUND MODE CHECK (1) Set MODE to GRD. (2) Traverse and elevate cannon.	Sight reticle remains illuminated. Cannon traverses and elevates normally.	Notify organizational maintenance. Troubleshoot (Upper Mount).
5. BUILT-IN-TEST Perform Built-In-Test.	No fault messages.	Troubleshoot (System Fault Messages).

END

BUILT IN TEST (BIT)

3-12 General. The Built-In-Test (BIT) is part of the Daily Armament System Check. Use it to check the system for proper operation and for general system troubleshooting. While performing the BIT procedure, watch for fault messages. Consult the procedure index for procedures referenced in the BIT procedure. The system performs four types of BITs: Start-Up BIT, On-Line BIT, Static BIT, and Off-Line BIT.

3-13 Start-Up BIT. Start-Up BIT runs automatically when the SYSTEM POWER is turned ON and the sight is uncaged. The test is completed in 4 seconds.

3-14 On-Line BIT. On-Line BIT continuously checks the radar and computer for faults during operation after Start-Up BIT has been completed. On-Line BIT is disabled in the TEST mode.

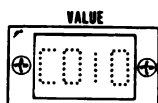
3-15 Static BIT. Static BIT runs automatically when the mode is changed from GROUND or EXTERNAL to RADAR or MANUAL and Start-Up BIT has been completed. The test runs for 150 seconds.

3-16 Off-Line BIT. Off-Line BIT checks the entire system when Start-Up BIT and Static BIT have been completed. Off-Line BIT requires crew assistance. The operator is instructed by BIT setup messages which are explained in table 3-3. The operator is required to perform the setup instructions in a given time limit or a fault may result. The test takes approximately 30 minutes to complete. The test may be interrupted at any time by selecting any mode except TEST and pressing either action switch.

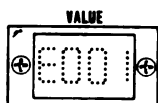
BUILT IN TEST (BIT) – Continued

BIT MESSAGES

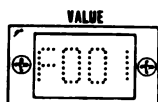
BIT test results and operator instructions are displayed on the BALLISTICS/BIT subpanel VALUE display. There are five types of messages: countdown, setup, fault, non-numerical, and numerical failure value.



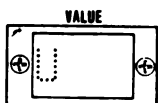
COUNTDOWN messages begin with the letter "C" followed by three numbers. These numbers represent the time in seconds that you are required to complete a critically timed test. If a fault is located during this time, the system searches for a defective replaceable unit. The countdown continues and the control panel FAULT indicator flashes. In some test setups, the test is conducted too rapidly for a countdown message to show. C999 messages indicate that the system is waiting for a manual setup and time is not limited by the system BIT. C ___ messages indicate that the system is automatically performing a critically timed test and will not count down.



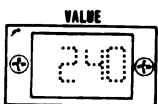
SETUP messages begin with the letter "E" followed by three numbers. These numbers tell the operator what steps must be executed to complete that part of the BIT procedure. Table 3-3 is a list of the setup messages, the steps that must be taken for each message, and the time allowed to perform the setup.



FAULT messages begin with the letter "F" followed by three numbers. These numbers are fault messages which tell the operator or organizational maintenance where the fault is located, so be sure to note the fault messages when they occur. Fault messages and corrective actions are explained in table 3-4.



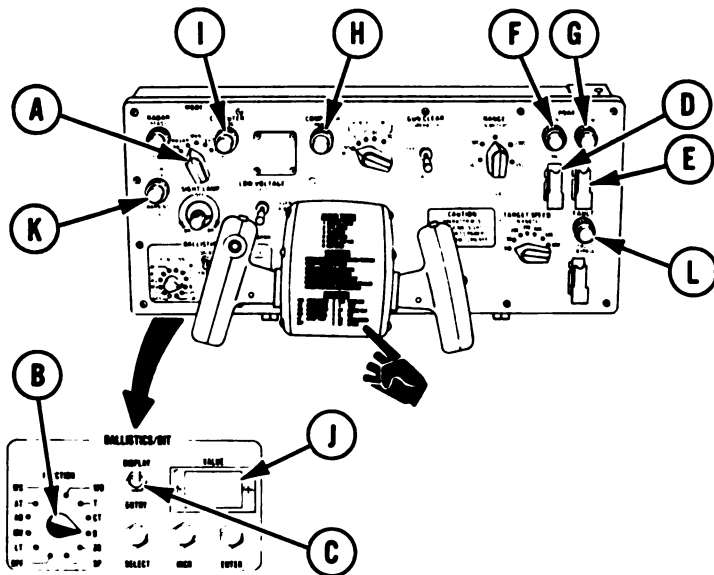
NON-NUMERICAL VALUE "U" messages are for organizational maintenance use. These messages indicate that there are no useable numerical values associated with the discovered fault.



NUMERICAL VALUE messages are also for use by organizational maintenance, so be sure to note these values when they occur. The numbers represent a measurement taken during Off-Line BIT.

BUILT IN TEST (BIT) – Continued

BIT POWER-UP PROCEDURE



1. Set the MODE switch (A) to RADAR.
2. Set the NORM-STATIC-TEST switch to STATIC.
3. Set the FUNCTION switch (B) to B (BIT).
4. Set the DISPLAY/ENTRY switch (C) to ENTRY.
5. Set SYSTEM POWER (E) to ON and uncage the sight.
6. Check that the SYSTEM POWER indicator (G) lights. If not, press the indicator to test. If the lamp is good, notify organizational maintenance. If the lamp is bad, replace the lamp.
7. Check that the COMPUTER POWER (H) and COMPUTER GOOD WHEN LIT (I) indicators light. If not, press the indicators to test. If the lamps are bad, replace the lamps. If the lamps are good, cage the sight, turn SYSTEM POWER to OFF then ON, and uncage the sight. If the indicators do not light, notify organizational maintenance.
8. Check that the LOW VOLTAGE indicator (K) is not flashing.
9. If a fault is detected the FAULT indicator flashes. To display the fault message on the VALUE display (J), set the DISPLAY/ENTRY switch to DISPLAY.

BUILT IN TEST (BIT) – Continued

START-UP BIT

1. Set the FUNCTION switch (B) to OFF. If a fault is located during Start-Up BIT, the FAULT indicator (L) flashes rapidly (4 times a second).
2. Set the FUNCTION switch to B and the DISPLAY/ENTRY switch to DISPLAY to read the fault message on the VALUE display. See table 3-4 for fault explanations and corrective actions.
3. Modes containing a fault are restricted from use, however, the system may still be able to operate in another mode. To determine if an operational mode is available, turn the MODE switch to each position. If the FAULT indicator flashes at a fast rate (4 times per second), that mode is a restricted mode. If the FAULT indicator flashes at a slower rate (1 time per second), that mode is unrestricted by the fault. Switch to an unrestricted mode for operation if possible.

WARNING



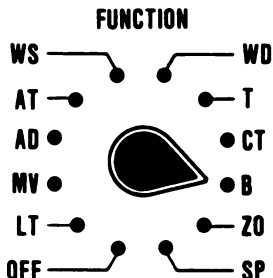
Operating the system in a restricted mode may result in unpredictable or unsafe performance. FAULT BYPASS should be used only when absolutely necessary. Warn all personnel in and around the area.



4. To operate the system in the restricted mode, set the FAULT BYPASS switch to ON. The FAULT indicator flash rate will not change. The system will operate in the restricted mode but may operate with degraded performance due to the fault.

ON-LINE BIT

On-Line BIT continuously monitors the radar and computer during system operation in all modes except TEST. Set the FUNCTION switch to B and the DISPLAY/ENTRY switch to DISPLAY for BIT monitoring during system operation.



DISPLAY



ENTRY

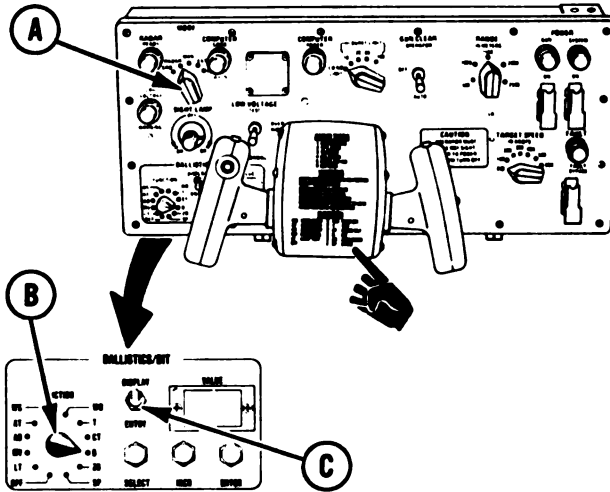
BUILT IN TEST (BIT) – Continued**STATIC BIT****NOTE**

Squeeze action switch after selecting
EXT or GRD modes or fault messages
may occur.

1. Set the MODE switch from EXT or GRD to MAN or RADAR to start the Static BIT. To enter the RADAR mode from the TEST mode, set the MODE switch to EXT, squeeze the action switch, then set the MODE switch to RADAR.
2. Set the DISPLAY/ENTRY switch to ENTRY. C150 is displayed and counts down to C000 unless a fault occurs.
3. If the fault lamp flashes, set the DISPLAY/ENTRY switch to DISPLAY to view the fault message. Press and release the ENTER pushbutton until all fault messages and numerical value messages have been displayed. Remember to note the fault and numerical value (measurement) messages for use by organizational maintenance.
4. To interrupt Static BIT, squeeze and release either action switch.

BUILT IN TEST (BIT) – Continued

OFF-LINE BIT



WARNING



Set up gun system in firing position. Ensure adequate clearance for rotation and elevation. Verify that radar can be radiated into unobstructed free space.



1. Set the elevation and azimuth drive brakes to ON.
2. Set the MODE switch (A) to TEST.
3. Set the FUNCTION switch (B) to B (BIT).
4. Set the DISPLAY/ENTRY switch (C) to ENTRY. The VALUE display will indicate E001, the first setup in Off-Line BIT.

BUILT IN TEST (BIT) – Continued**OFF-LINE BIT – Continued**

5. Perform the test setups as described in table 3-3 when the setup messages appear on the VALUE display. Keep in mind the following general procedures:

GENERAL PROCEDURES

- Messages E001 through E091 are normal setup messages. They occur in order and require minimum operator assistance to complete.
- Messages E238, E240 through E244, E251, and E253 through E256 are fault isolation setup messages. They may occur during any test setup and in any order. The operator is directed to perform additional tasks to complete these setups so that the fire control processor can isolate suspected faults.
- Some of the normal setup messages must be performed in sequenced groups or pairs. If one of these setup messages is entered out of sequence, the BIT system will automatically return to the first setup message in that sequenced group or pair, then proceed through each setup message in proper sequence. The following setup messages are performed in groups or pairs in the sequence shown:

E037 - E038	E066 - E067
E039 - E040	E068 - E069
E041 - E042	E070 - E071
E043 - E044	E072 - E073
E051 - E052	E074 - E075
E053 - E054	E076 - E077
E055 - E056, E057, E058, E059	E078 - E079
E060 - E061	E080 - E081
E062 - E063	E082 - E083
E064 - E065	E086 - E087

BUILT IN TEST (BIT) – Continued

OFF-LINE BIT – Continued

GENERAL PROCEDURES – Continued

- Observe warnings and cautions associated with all setup messages.
- Press and release the ENTER pushbutton as directed for each setup.
- The VALUE display indicates time in seconds remaining to do the setup after the ENTER pushbutton is pressed. C999 and C ___ messages do not count down.
- If no fault is detected, the VALUE display immediately directs the operator to the next setup.
- If a fault is located, the countdown stops and the fault message is displayed. Note the fault message. The FAULT indicator will flash.
- To display the numerical value (measurement) related to the fault, press and release ENTER. Note the value. If no useful measured data exists, a U ___ message is displayed.
- Press and release ENTER to display the setup in which the fault occurred. Repeat the setup within the time limit to verify the fault. If the fault continues, the test will not proceed. Take corrective action listed for system fault message in Table 3-4.
- After corrective action has been taken, cage the sight, turn SYSTEM POWER to OFF then ON and uncage the sight. When E001 is displayed, perform the setup message that previously failed to verify successful repair. Return to E001 from the previously failed setup message and repeat Off-Line BIT.
- Perform the set up messages as directed until the VALUE display shows the desired ending message. The ending message possible are A1, A2, and A3. To return to setup message E001 after A1, A2, or A3 are displayed, press and release ENTER.
 - A1 message is displayed when setup messages E001 through E091 are performed in sequence and no critical errors are detected by BIT. Setup steps E001 through E091 test the entire system.
 - A2 message is displayed when setup messages E001 through E065 are performed in sequence and no critical errors are detected by BIT. Setup steps E001 through E065 test the entire system with the exception of the distribution box.
 - A3 message is displayed when setup messages E066 through E091 are completed in sequence and no critical errors are detected by BIT. Setup steps E066 through E091 test the system distribution box.
- To cancel Off-Line BIT, set the MODE switch to the desired operating mode and squeeze and release either action switch.

Table 3-3. Test Setup Messages

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
	<p style="text-align: center;">CAUTION</p> <p>If the control panel displays a U _ _ _ message, or is otherwise abnormal when powered up, notify organizational maintenance.</p> <p style="text-align: center;">NOTE</p> <p>Certain faults will cause Off-Line BIT to return to E001. Setup message E001 will reappear without a fault message; however the FAULT lamp will be flashing. The fault message can be observed with the DISPLAY/ENTRY switch in the DISPLAY position.</p>	
E001	<p>Set gun at approximately zero degrees elevation</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Set azimuth, elevation, and gun drive brake levers to ON.</p> <p style="text-align: center;">NOTE</p> <p>Avoid moving the weapon during this test or an incorrect fault message may result.</p> <p>Press and release ENTER pushbutton.</p>	C377
E002	<p>Set DISPLAY/ENTRY switch to ENTRY.</p> <p>Press and release ENTER pushbutton.</p>	
E003	<p>Press and release ENTER pushbutton.</p> <p>Press and release SELECT pushbutton before countdown message reaches C000.</p>	C005

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E004	Press and release ENTER pushbutton. Press and release INCR pushbutton before countdown message reaches C000.	C005
E005	Press and release ENTER pushbutton. Observe VALUE display and verify that all characters are displayed for each digit. <div><div>0 0 0 0</div><div>1 1 1 1</div><div>2 2 2 2</div><div>3 3 3 3</div><div>4 4 4 4</div><div>5 5 5 5</div><div>6 6 6 6</div><div>7 7 7 7</div><div>8 8 8 8</div></div> <div><div>9 9 9 9</div><div>A _ _ _</div><div>- _ _ _</div><div>C _ _ _</div><div>E _ _ _</div><div>F _ _ _</div><div>U _ _ _</div><div>= _ _ _</div></div>	
	If any characters are incorrect, press and release SELECT pushbutton. If there are no faults, press and release ENTER pushbutton.	
E006	Press and release ENTER pushbutton Set DISPLAY/ENTRY switch momentarily to DISPLAY and back to ENTRY position before countdown message reaches C000.	C005
E007	Set FUNCTION switch to OFF. Press and release ENTER pushbutton. Press and release SELECT pushbutton before countdown message reaches C000.	C005
E008	Set FUNCTION switch to MV. Press and release ENTER pushbutton.	-

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E009	Set FUNCTION switch to AD. Press and release ENTER pushbutton.	-
E010	Set FUNCTION switch to AT. Press and release ENTER pushbutton.	-
E011	Set FUNCTION switch to WS. Press and release ENTER pushbutton.	-
E012	Set FUNCTION switch to WD. Press and release ENTER pushbutton.	-
E013	Set FUNCTION switch to T. Press and release ENTER pushbutton.	-
E014	Set FUNCTION switch to CT. Press and release ENTER pushbutton.	-
E015	Set FUNCTION switch to ZO. Press and release ENTER pushbutton.	-
E016	Set FUNCTION switch to B. Press and release ENTER pushbutton.	-
E017	Set MODE switch to EXT. Press and release ENTER pushbutton.	-
E018	Set MODE switch to MAN. Press and release ENTER pushbutton.	-
E019	Set MODE switch to RADAR. Press and release ENTER pushbutton.	-

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E020	Set MODE switch to GRD. Press and release ENTER pushbutton.	-
E021	Set MODE switch to TEST. Press and release ENTER pushbutton.	-
E022	Set FAULT BYPASS switch to ON (up). Press and release ENTER pushbutton.	-
E023	Set FAULT BYPASS switch to OFF (down). Squeeze and hold action switch. Press and release ENTER pushbutton. When E024 or FXXX message appears, release action switch.	-
E024	Press and release ENTER pushbutton.	-
E025	Press and hold ACQ/TRK pushbutton. Press and release ENTER pushbutton. When E026 or FXXX message appears, release ACQ/TRK pushbutton.	-
E026	Press and release ENTER pushbutton.	-
E027	Set RANGE IN METERS knob to fully counter clockwise position, then clockwise to 1500. Press and release ENTER pushbutton.	-

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E028	<p>Set TARGET SPEED IN KNOTS knob to 300.</p> <p>Set RANGE IN METERS knob to fully clockwise position, then counterclockwise to 1500.</p> <p>Press and release ENTER pushbutton.</p>	-
E029	<p>Move and hold hand controls to extreme right position.</p> <p>Press and release ENTER pushbutton.</p>	-
E030	<p>Move and hold hand controls to extreme up position.</p> <p>Press and release ENTER pushbutton.</p>	-
E031	<p>Release hand controls</p> <p>When hand controls come to rest, press and release ENTER pushbutton.</p>	-
E032	<p>Press and release ENTER pushbutton.</p> <p>Observe FAULT lamp and verify it is blinking.</p> <p>If not, press and release SELECT pushbutton.</p> <p>If FAULT lamp is blinking, press and release ENTER pushbutton.</p>	-

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
■ E033	<p>Press and release ENTER pushbutton.</p> <p>Observe COMPUTER GOOD lamp and verify it is blinking.</p> <p>If not, press and release SELECT pushbutton.</p> <p>If COMPUTER GOOD lamp is blinking, press and release ENTER pushbutton immediately.</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">FAULT lamp will also blink. Ignore it for this test.</p>	-
■ E034	<p>Press and release ENTER pushbutton.</p> <p>Observe Ready-To-Fire lamp and verify it is blinking.</p> <p>If not, press and release SELECT pushbutton.</p> <p>If Ready-To-Fire lamp is blinking, press and release ENTER pushbutton immediately.</p>	-
■ E035	<p>Press and release ENTER pushbutton.</p> <p>Observe Track/Jam/Radiate lamp and verify it is blinking.</p> <p>If not, press and release SELECT pushbutton.</p> <p>If there are no faults, press and release ENTER pushbutton immediately.</p>	-

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E036	<p>Press and release ENTER pushbutton.</p> <p>Observe range meter in gun sight and verify that the range meter increases smoothly from approximately 0 to 5000 meters and back in 3 seconds repeating the process continuously.</p> <p>If range meter is not cycling, press and release SELECT pushbutton.</p> <p>If range meter is cycling, press and release ENTER pushbutton immediately.</p>	-
E037	<div style="display: flex; align-items: center; justify-content: space-around;">  <p>WARNING</p>  </div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should rapidly position itself to 45° elevation.</p> <p>Set NORM-STATIC-TEST switch to NORM.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E038 or FXXX message appears, release action switch.</p>	C015

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E038	<div> </div> <div> </div> <p>WARNING</p> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should elevate slowly.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E039 or FXXX message appears, release action switch.</p>	C015

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E039	<div></div> <div>WARNING</div> <div></div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should position itself at 45° elevation.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E040 or FXXX message appears, release action switch.</p>	C015
E040	<div></div> <div>WARNING</div> <div></div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should lower slowly.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E041 or FXXX message appears, release action switch.</p>	C015

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E041	<div></div> <div>WARNING</div> <div></div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should rapidly position itself at 45° elevation.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E042 or FXXX message appears, release action switch.</p>	C015
E042	<div></div> <div>WARNING</div> <div></div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should jerk upward and stop.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E043 or FXXX message appears, release action switch.</p>	C015

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E043	<div></div> <div>WARNING</div> <div></div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should slowly position itself at 45° elevation.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E044 or FXXX message appears, release action switch.</p>	C015
E044	<div></div> <div>WARNING</div> <div></div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should jerk downward and stop.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E045 or FXXX message appears, release action switch.</p>	C015

Table 3-3. Setup Messages - Continued





SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E045	 WARNING  <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should position itself at 0° elevation and then move slowly to the right.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E046 or FXXX message appears, release action switch.</p>	C015
E046	 WARNING  <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should position itself at 0° elevation then move slowly to the left.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E047 or FXXX message appears, release action switch.</p>	C015

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E047	<div></div> <div>WARNING</div> <div></div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should position itself at 0° elevation then jerk to the right and stop.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E048 or FXXX message appears, release action switch.</p>	C015
E048	<div></div> <div>WARNING</div> <div></div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should position itself at 0° elevation then jerk to the left and stop.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E049 or FXXX message appears, release action switch.</p>	C015

Table 3-3. Setup Messages - Continued





SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E049	<div>WARNING</div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should slowly position itself at -4° elevation.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E050 or FXXX message appears, release action switch.</p>	C015
E050	<div>WARNING</div> <p>DO NOT execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p>Gun should position itself at 78° elevation.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E051 or FXXX message appears, release action switch.</p> <p>Using hand controls, position gun at approximately 0° elevation.</p>	C015

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
	<p>NOTE</p> <p>If gun is not at 0° elevation, use hand controls to position gun at approximately 0° elevation.</p>	
E051	<p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Press and release ENTER pushbutton.</p>	-
E052	Press and release ENTER pushbutton.	-
E053	Press and release ENTER pushbutton.	-
E054	Press and release ENTER pushbutton.	-
E055	Press and release ENTER pushbutton.	-
E056	Press and release ENTER pushbutton.	-
E057	Press and release ENTER pushbutton.	-
E058	Press and release ENTER pushbutton.	-
E059	Press and release ENTER pushbutton.	-

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E060	<div></div> <p>WARNING</p> <p>The radar will radiate during this test setup. Observe all safety precautions to prevent harm to personnel and equipment. DO NOT radiate against a target less than 250 meters away. DO NOT radiate within a building or metal shelter. Keep personnel away from radar antenna.</p> <p>Set NORM-STATIC-TEST switch to NORM.</p> <p>Using hand controls, rotate and elevate weapon so that radar antenna points at a clear area.</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Wait until RADAR READY lamp lights, or until approximately 2-1/2 minutes have elapsed. If either Unit 2 OVERLOAD lamps are lit, press and release OVERLOAD RESET switch.</p> <p>Squeeze and hold action switch.</p> <p>Depress footswitch.</p> <p>Press and release ENTER pushbutton.</p> <p>Keep action switch and footswitch pressed until E061 or FXXX message appears, then release.</p>	C005
E061	<p>Press and release ENTER pushbutton.</p>	C002

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E062	<p>Wait until RADAR READY lamp lights, or until approximately 2-1/2 minutes have elapsed. If either Unit 2 OVERLOAD lamps are lit, press and release OVERLOAD RESET switch.</p> <p>Press and release ENTER pushbutton.</p>	C015
E063	<div> </div> <div> <p>WARNING</p> </div> <div> </div> <p>DO NOT execute test setup message E063 until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position.</p> <p>Release action switch should the mount or gun unexpectedly move.</p> <p style="text-align: center;">NOTE</p> <p>Gun and antenna will move rapidly in elevation to 0° when action switch is closed. Five seconds after the gun stops moving the antenna will start to move.</p> <p>Set radar distribution box, Unit 6, switches (MODE at NORMAL, MAINT to OFF)</p> <p>Set NORM-STATIC-TEST switch to NORM.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and hold action switch.</p> <p>When E064 or FXXX message appears, release action switch.</p>	C060

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E064	<p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Set RANGE IN METERS knob on control panel to 500.</p> <p>Connect external range control assembly to carriage receptacle.</p> <p>Set external range control assembly knob to fully counterclockwise position, then clockwise to 15.</p> <p>Set MODE switch to EXT.</p> <p>Press and release ENTER pushbutton.</p>	C _ _ _
E065	<p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Connect external range control assembly to carriage receptacle.</p> <p>Set external range control assembly knob to fully clockwise position, then counter clockwise to 15.</p> <p>Set MODE switch to EXT.</p> <p>Press and hold down external range control assembly enable pushbutton.</p> <p>Press and release ENTER pushbutton.</p> <p>Release external range control assembly enable pushbutton.</p>	C _ _ _
A2	<p>Main Test Sequence successfully completed.</p> <p>Disconnect external range control assembly.</p>	

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
A1	<p>NOTE</p> <p>The A1___ message is displayed when the Main Test Sequence (Setup Messages E001 thru E065) and the D-Box Test (Setup Messages E066 thru E091) are successfully completed.</p> <p>To test the D-Box:</p> <p>Press and release ENTER pushbutton, the VALUE display will show E001.</p> <p>Enter E066 on the VALUE display using the SELECT and INCR pushbuttons. Continue testing.</p> <p>NOTE</p> <p>If the cannon does not require bore-sighting or radar frequency change at this time, return all controls to the PRECHECK CONDITIONS in table 3-2.</p> <p>Shut down the APU and install the arming connector.</p>	

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E066	<p>NOTE</p> <p>When the initial test sequence begins with the D-Box test (Setup Messages E066 thru E091) the Daily Armament System checks must be performed prior to execution of Setup Message E066.</p> <p>If testing is being continued from Setup Message E065 to E066, Daily Armament System check need <u>not</u> be performed.</p> <p>NOTE</p> <p>Perform Daily Armament System checks Table 3-2.</p> <p>Set MODE switch to TEST.</p> <p>Set the BALLISTICS/BIT FUNCTION switch to B (BIT) and the DISPLAY/ENTRY switch to ENTRY. The VALUE display will show E001.</p> <p>Enter E066 on the VALUE display using the SELECT and INCR pushbuttons.</p> <p>NOTE</p> <p>Test setup messages E066 through E090 require the fire interrupter switch to be in the OFF position. This is to override any protected areas set into the firing interrupter during Off-Line BIT. If the switch is left ON during E066 through E090 and slide rod or rods are pulled out for protected areas only, BIT will identify fault message F050.</p>	C005

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E066 Cont.	<div></div> <p>WARNING</p> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E067	<p>Set GUN POWER switch to ON.</p> <p>Set GUN CLEAR switch to AUTO.</p> <p>Press and release ENTER pushbutton.</p>	C _ _ _
E068	<p> WARNING </p> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	C005
E069	<p>Set FIRING RATE switch to LO-NO LIMIT.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>Do not Operate trigger until a C005 message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>When E070 or FXXX message appears, release both action and trigger switches.</p>	C005

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E070	<div></div> <div>WARNING</div> <div></div> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	C005
E071	<p>Set FIRING RATE switch to LO-ON LIMIT.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>Do not operate trigger until a C _ _ _ message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>After approximately 1 second, release both action and trigger switches.</p>	C _ _ _

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E072	<div></div> <p>WARNING</p> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	C005
E073	<p>Set FIRING RATE switch to 10.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>Do not operate trigger until a C _ _ _ message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>When E074 or FXXX message appears, release both action and trigger switches.</p>	C _ _ _

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E074	<div> </div> <div> <p>WARNING</p> </div> <div> </div> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	C005
E075	<p>Set FIRING RATE switch to 10.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>DO NOT operate trigger until a C010 message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>When E076 or FXXX message appears, release both action and trigger switches.</p>	C010

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
	  <p>WARNING</p> <p>To prevent firing during this test, do the following:</p>	C005
E076	<p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	
E077	<p>Set FIRING RATE switch to 10.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>DO NOT operate trigger until a C010 message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>When E078 or FXXX message appears, release both action and trigger switches.</p>	C010

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E078	<div> </div> <div>WARNING</div> <div> </div> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	C005
E079	<p>Set FIRING RATE switch to 10.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>DO NOT operate trigger until a C010 message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>When E080 or FXXX message appears, release both action and trigger switches.</p>	C010

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E080	<div></div> <p>WARNING</p> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	C005
E081	<p>Set FIRING RATE switch to 30.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>DO NOT operate trigger until a C010 message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>When E082 or FXXX message appears, release both action and trigger switches.</p>	C010

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E082	<div></div> <p>WARNING</p> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	C005
E083	<p>Set FIRING RATE switch to 60.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>DO NOT operate trigger until a C010 message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>When E084 or FXXX message appears, release both action and trigger switches.</p>	C010

Table 3-3. Setup Messages - Continued


SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E084	<div><p>WARNING</p><p>To prevent firing during this test, do the following:</p><p>Set NORM-STATIC-TEST switch to STATIC.</p><p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p><p>Set firing interrupter switch to OFF.</p><p>Connect arming connector to A7J2 on firing interrupter.</p><p>Press and release ENTER pushbutton.</p></div>	C005
E085	<div><p>Set FIRING RATE switch to 100.</p><p>Press and release ENTER pushbutton.</p><p>NOTE</p><p>Do not operate trigger until a C010 message appears.</p><p>Press and hold action and trigger switches simultaneously.</p><p>When E086 or FXXX message appears, release both action and trigger switches.</p></div>	C010

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E086	<div> </div> <div> </div> <p>WARNING</p> <p>To prevent firing during this test, do the following:</p> <p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	C005

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E087	<p>Set FIRING RATE switch to LO-NO LIMIT.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>Do not operate trigger until a C010 message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>When E088 or FXXX message appears, release both action and trigger switches.</p> <div><p>WARNING</p></div> <p>To prevent firing during this test, do the following:</p>	<p>C010</p> <p>C005</p>
E088	<p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Disconnect connector W3P1 from receptacle A1J3 on distribution box.</p> <p>Set firing interrupter switch to OFF.</p> <p>Connect arming connector to A7J2 on firing interrupter.</p> <p>Press and release ENTER pushbutton.</p>	

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E089	<p>Set FIRING RATE switch to LO-NO LIMIT.</p> <p>Press and release ENTER pushbutton.</p> <p>NOTE</p> <p>Do not operate trigger until a C010 message appears.</p> <p>Press and hold action and trigger switches simultaneously.</p> <p>Wait approximately 1 second, then release both action and trigger switches.</p>	C010

Table 3-3. Setup Messages - Continued





SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E090	<p>Set GUN POWER switch to OFF</p> <p>Press and release ENTER pushbutton.</p>	
E091	<div><p>WARNING</p></div> <p>Cannon will be operational after this test setup.</p> <p>Connect connector W3P1 to receptacle A1J3 on distribution box.</p> <p>Remove arming connector from A7J2 on firing interrupter.</p> <p>Set firing interrupter switch to ON.</p> <p>Press and release ENTER pushbutton.</p>	
A3	<p>D-Box test successfully completed.</p>	

Table 3-3. Setup Messages - Continued



SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
A1	<p>NOTE</p> <p>The A1 ____ message is displayed when the D-Box Test (Setup Messages E066 thru E091) and the Main Test Sequence (Setup Messages E001 thru E065) are successfully completed.</p> <p>To test the Main Test Sequence: Press and release ENTER pushbutton, the VALUE display will show E001. Continue testing.</p> <p>NOTE</p> <p>If the cannon does not require bore-sighting or radar frequency change at this time, return all controls to the PRECHECK CONDITIONS in table 3-2.</p> <p>Shut down the APU and install the arming connector.</p> <p>"All data on pages 3-68 thru 3-70 deleted."</p>	

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E251	<p>Set NORM-STATIC-TEST switch to STATIC.</p> <p>Release elevation drive brake.</p> <p>Manually position gun at an elevation of approximately 45°.</p> <p>Set elevation drive brake to ON.</p> <p>Set NORM-STATIC-TEST switch to NORM.</p> <p>Press and release ENTER pushbutton.</p>	
E253	<div><p>WARNING</p></div> <p>The radar will radiate during this test. Observe all safety precautions to prevent harm to personnel and equipment. Do not radiate against a target less than 250 meters away. DO NOT radiate within a building or metal shelter. Keep personnel away from radar antenna.</p> <p>Set MODE switch to EXT for at least one second, then return MODE switch to TEST.</p> <p>Wait until RADAR READY lamp lights or approximately 2-1/2 minutes have elapsed. If either Unit 2 OVERLOAD lamps are lit, press and release OVERLOAD RESET switch.</p> <p>Press and release ENTER pushbutton.</p>	C _ _ _

"All data on page 3-72 deleted"

Table 3-3. Setup Messages - Continued

SETUP MESSAGES	CONTROL REQUIREMENT	COUNTDOWN TIME (SEC)
E255	<p style="text-align: center;">NOTE</p> <p>If action switch is not released before ENTER pushbutton is pressed, an incorrect fault may result.</p> <p>Release action switch.</p> <p>Press and release ENTER pushbutton.</p>	
E256	<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p style="text-align: center;">WARNING</p> <p>Do not execute this setup until mount is clear of people and obstructions and an ALL-CLEAR warning is given.</p> <p>Beware of sudden changes in gun position that might occur.</p> <p>Operator shall be prepared to instantly release action switch should the mount or gun unexpectedly move.</p> <p>Release action switch.</p> <p>Press and release ENTER pushbutton.</p> <p>Squeeze and release action switch.</p> </div>  </div>	C _ _ _

END

BORESIGHTING

3-17 General. Boresighting is performed before firing to ensure sighting accuracy between the M61A1 sight, the M134 straight telescope, the AN/TVS-2B or AN/TVS-5 night sights, and the cannon. It should be reaccomplished when the gun system has been moved to a different location or when parts have been replaced that may affect firing accuracy (such as the sight or antenna). Boresighting should also be performed periodically if the gun system is emplaced in the same location for long periods. There are two methods of boresighting: the target method and the distant aiming point method.

3-18 Target Method. The target method is more accurate than the distant aiming point method and is the preferred method to use for boresighting. Use the target method when time and situation permit or when visibility is limited (under 2500 meters). Performance of this method requires two crewmen.

3-19 Distant Aiming Point Method. The distant aiming point method is used when the target method cannot be performed. There must be good visibility (2500 meters) to the distant aiming point selected. This method requires two crewmen.

BORESIGHTING – Continued**TARGET METHOD**

1. Emplace the gun system in a level unobstructed area if not done already. (See GUN EMPLACEMENT, page 2-40).
2. Set the GUN POWER switch to OFF and the NORM-STATIC-TEST switch to STATIC.
3. Unlock the elevation and azimuth drive brakes.
4. Remove the arming connector from the firing interrupter.

CAUTION

When rotating barrels manually,
rotate them slowly to prevent
damage to the index pin.

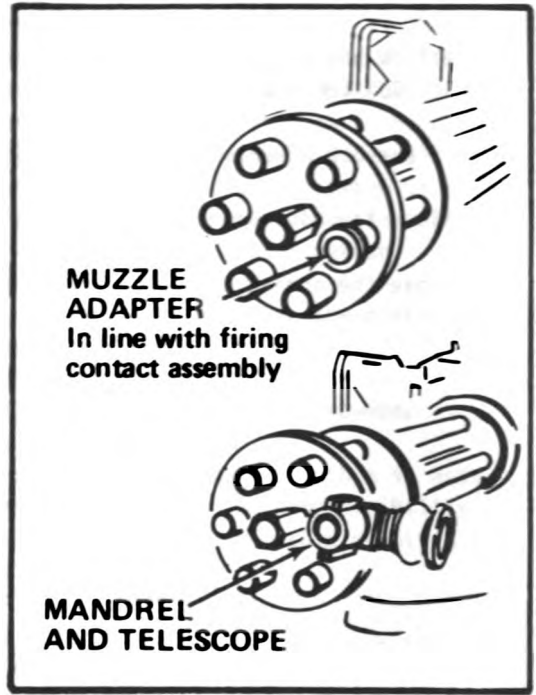
Ensure BRAKE-CLEAR AND BRAKE
switch is not used more than
10 seconds during any 1 minute
interval or damage to the
feeder solenoid may result.

5. Clear the cannon by holding the BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE and manually rotate cannon barrels slowly two complete revolutions. Remove any rounds in case chute.
6. Hold the BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE. Depress the cannon index pin and position the No. 1 barrel in the firing position at 4 o'clock as viewed from the muzzle end. Release the switch and index pin. Check that the pin has returned to its normal (out) position.

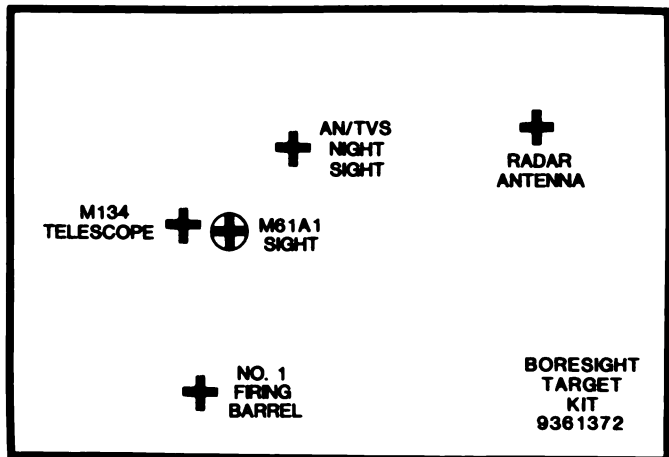
BORESIGHTING – Continued

TARGET METHOD – Continued

7. Make sure that the mandrel and boresight telescope are properly assembled. Insert the assembly into the muzzle adapter with the eyepiece in a horizontal position to the left of the barrels. Press the mandrel assembly and adapter tightly into the muzzle of the No. 1 barrel in line with the firing contact.
8. Set up the boresight target (9361372) at 34 paces (about 25 meters) from the muzzle of the cannon at a height that places the No. 1 firing barrel cross approximately on target when viewed through the boresight telescope.



9. Set SYSTEM POWER to ON and uncage the sight. Set the MODE switch to TEST. Check that the sight reticle lights immediately. Adjust the control assembly SIGHT LAMP knob for a clear reticle in the sight.
10. Set the FUNCTION switch to B and the DISPLAY/ENTRY switch to ENTRY. Enter E907 to display gun elevation in mils. Manually rotate the mount toward the proposed boresight target location and position the cannon at approximately zero degrees elevation ± 20 mils (6380 to 0020) as shown on the VALUE display.



BORESIGHTING – Continued**TARGET METHOD – Continued**

11. Level and square the boresight target with the cannon as follows:

- Manually move gun using downward pressure only until the boresight reticle center is at the boresight target bottom right corner (± 1 mil).
- Set the elevation drive brake to ON.
- If the bottom edge of the target is more than 1 mil from boresight reticle center, tilt the target until the boresight reticle plumbs the lower edge of the boresight target within 1 mil as the gun is manually moved in azimuth (repeat step 11 until this occurs).
- The boresight target surface should be perpendicular with the boresight telescope line of sight.

12. Set the radar stow control (unit 6) MODE switch to NORMAL and the MAINT switch to OFF.

13. Set the elevation drive brake to OFF.

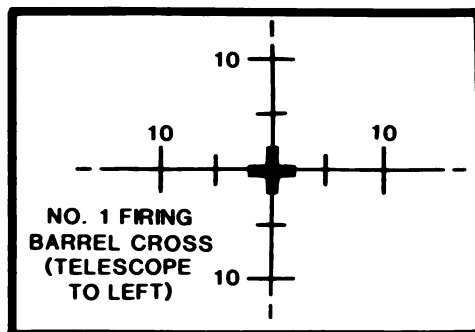
BORESIGHTING – Continued

TARGET METHOD – Continued

NOTE

During sighting with a fixed boresight target, always hold the cannon down and to the left to compensate for system backlash. If you overshoot the No. 1 firing barrel aiming point, return gun up and right and again apply down or left pressure until the reticle rests on aiming point. Be certain to keep the boresight telescope crosshairs in the center of the boresight telescope field of view.

14. Hold cannon down and to the left. Sight through the boresight telescope and line up the crosshairs on the No. 1 firing barrel cross on the boresight target. Lock the elevation and azimuth drive brakes and check that the No. 1 firing barrel (with boresight telescope) is still centered on the No. 1 firing barrel cross. If not, unlock the brakes and repeat this step.



15. Hold cannon to the right and up by pushing (approximately 20 lbs) against the gun barrel. Release pressure, then sight through the boresight telescope to check that the crosshairs are displaced less than 4 mils (in either azimuth or elevation) from the No. 1 firing barrel cross.

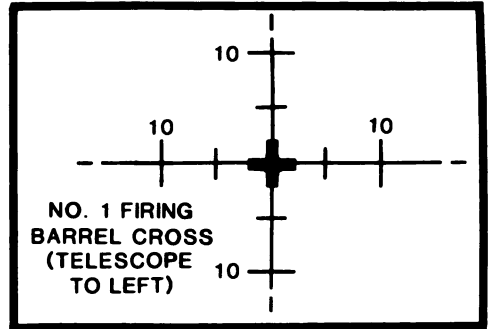
NOTE

If crosshairs are displaced more than 4 mils, discontinue boresighting procedure and notify organizational maintenance.

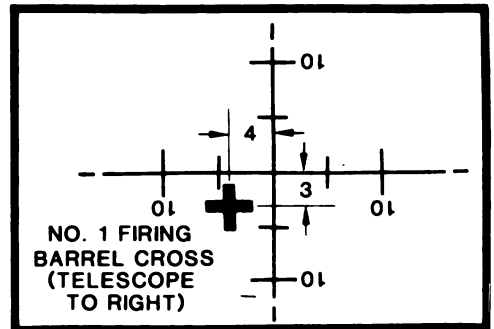
BORESIGHTING – Continued

TARGET METHOD – Continued

16. Place pressure (approximately 20 lbs) on the end of the gun to return the gun down and left. With the boresight telescope and mandrel assembly to the left side of the gun, sight through the boresight telescope. The crosshairs should still be centered on the No. 1 firing barrel cross.

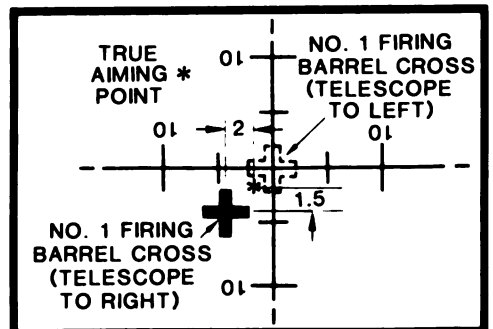


17. Rotate the boresight telescope and mandrel assembly (but NOT the muzzle adapter) 180 degrees to a horizontal position on the right side of the barrel. Sight through the boresight telescope and note where the crosshairs lie with respect to the No. 1 firing barrel cross.



If the crosshairs are displaced MORE than 5 mils from the No. 1 firing barrel cross, the boresight kit is defective. Replace boresight kit and repeat boresighting procedure.

If the crosshairs are displaced LESS than 5 mils, continue to use the boresight kit. Note the point halfway between the No. 1 firing barrel cross and the boresight telescope crosshairs. This point is the true aiming point. Note the position of the true aiming point with respect to the No. 1 firing barrel cross.



BORESIGHTING – Continued

TARGET METHOD – Continued

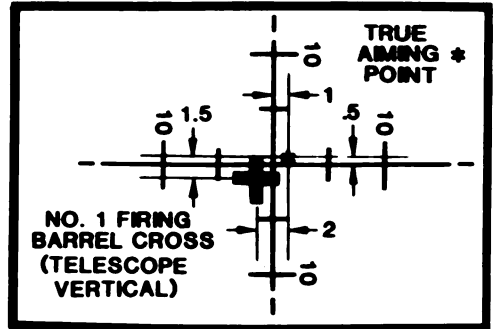
18. Rotate the boresight telescope and mandrel assembly (but NOT the muzzle adapter) so that the eyepiece is in a vertical position.

NOTE

The boresight telescope crosshairs may shift to a new position in the vertical position. If so, note the position of the boresight telescope crosshairs with respect to the No. 1 firing barrel cross and the true aiming point.

IMPORTANT:

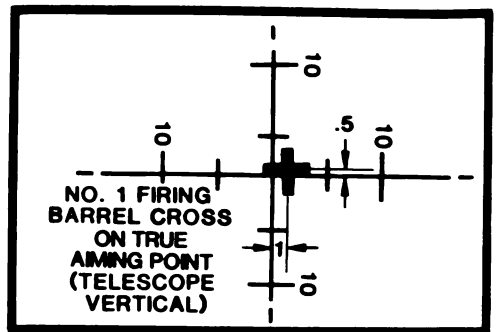
When positioning the gun barrel, ensure that the final adjustment is always made using down and left pressure.



19. Set the elevation and azimuth drive brakes to OFF. Sight through the boresight telescope (still in the vertical position) and manually position the cannon so that the No. 1 firing barrel cross is centered on the true aiming point.

NOTE

Use the relative positions of the boresight telescope crosshairs, No. 1 firing barrel cross, and true aiming point noted in steps 17 and 18 to assist in determining correct cannon position.



BORESIGHTING – Continued

TARGET METHOD – Continued

20. Lock the elevation and azimuth drive brakes and check that the crosshairs have not moved.
21. Press and release the ENTER pushbutton to terminate the E907 test setup. The VALUE display should show E001 with digit 1 flashing, indicating that it is ready to be updated.
22. Enter E908 on the VALUE display using the SELECT and INCR pushbuttons. When you have E908 on the VALUE display, press and release the ENTER pushbutton. The VALUE display should show C999.
23. Remove any shock mount preset before boresighting by placing your hand on top of the sight and gently rocking the sight side-to-side and front-to-back (\pm 5 mils as indicated on the sight reticle).

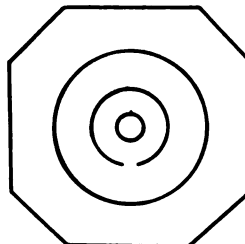
NOTE

The difference in the aiming point when the sight is pushed forward, back, left, and right then released should not exceed 3 mils for each direction pushed. If displaced more than 3 mils, notify organizational maintenance.

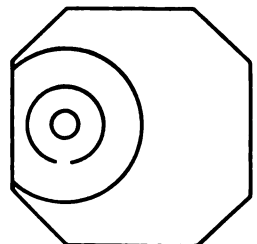
IMPORTANT: Prior to boresighting, pull sight back gently (5 mils) and release SLOWLY.

NOTE

Always view the M61A1 sight image so that the reticle is centered in the housing and combining glass.



RIGHT



WRONG

24. If the M61A1 sight 5 mil circle aiming point on the boresight target is in the center of the 5 mil reticle of the M61A1 sight, no further boresight corrections are required. Proceed to step 32.

BORESIGHTING – Continued

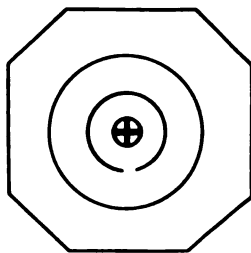
TARGET METHOD – Continued

25. A second crewman looks through the boresight telescope as adjustments are being made to make sure cannon does not move.

NOTE

If the sight reticle will not move in the following steps, notify organizational maintenance.

It is normal for the hand control to move the sight reticle at a slow rate during boresighting. This ensures greater boresighting accuracy.



26. Press the action switch and use the hand control to center the reticle on the boresight target M61A1 sight 5 mil circle. Always keep the sight reticle in the center of the combining glass.
27. Release the action switch when the 5 mil sight reticle is centered on the boresight target (± 0.5 mil).

NOTE

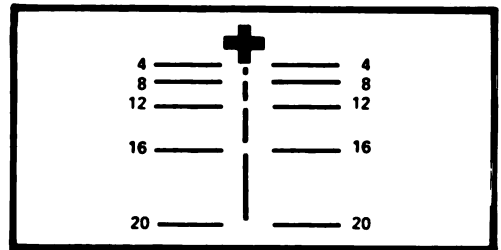
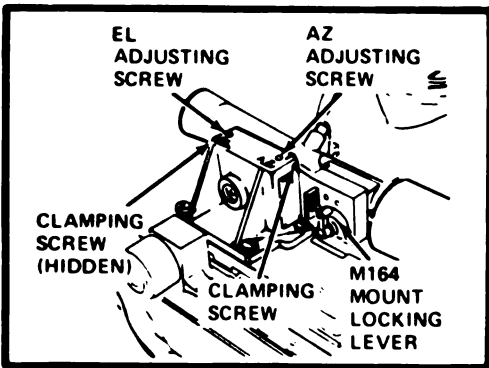
If you wish to record the boresight reading, perform steps 28 through 31; otherwise, proceed to step 32.

28. Press the SELECT pushbutton. The VALUE display shows A __ __ (indicating azimuth will be displayed next).
29. Press SELECT. The VALUE display shows the azimuth offset value \pm X X X where "X X X" is the azimuth boresight value in 0.1 mil units from 000 (0 mil) to ± 100 (± 10.0 mils).
30. Press SELECT. The VALUE display shows E __ __ (indicating elevation will be displayed next).
31. Press SELECT. The VALUE display shows the elevation offset value \pm X X X where "X X X" is the elevation boresight value in 0.1 mil units.

BORESIGHTING – Continued

TARGET METHOD – Continued

32. If the M134 straight telescope is to be used, install it on the M164 mount. (See page 2-33.) Boresight the straight telescope as follows:
 - Remove the lens cap from the M134 telescope. Loosen the elevation and azimuth clamping screws.
 - Look through the M134 telescope and adjust the azimuth and elevation adjusting screws until the cross in the reticle is aligned with the M134 telescope aiming cross on the target.
 - Tighten the clamping screws and install the lens cover.



33. If the AN/TVS-2B or AN/TVS-5 night sight is to be used, install it to the right of the M61A1 sight. (See page 2-90.) Boresight the night sight as follows:
 - Position the cannon so that the cross of the M134 reticle is aligned with the M134 telescope aiming point on the target.

BORESIGHTING – Continued

TARGET METHOD – Continued

CAUTION

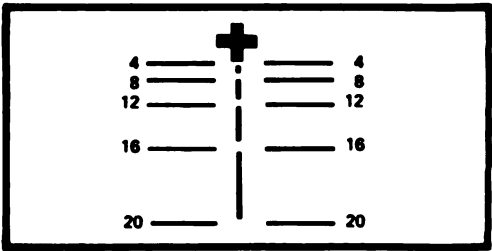
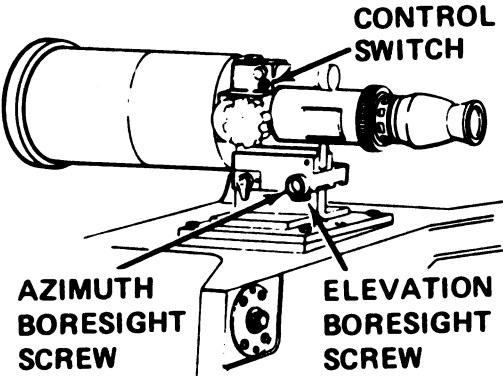
DO NOT remove the night sight lens cover in the daylight. DO NOT allow sun to shine directly into the lens aperture.

- Turn the night sight control switch to the SIGHT AND RETICLE position. Open the small aperture in the lens cover.
- Look through the night sight and turn the azimuth and elevation adjusting screws to align the night sight reticle with the AN/TVS aiming cross.
- Close the aperture and turn the night sight control switch to the OFF position.

WARNING



Always wait 5 minutes after turning off night sight before removing its batteries. A residual charge of approximately 45,000 volts exists after power is turned off.



BORESIGHTING – Continued

TARGET METHOD – Continued

34. Remove the boresight telescope and mandrel assembly from the muzzle adapter then remove the muzzle adapter from the cannon barrel.

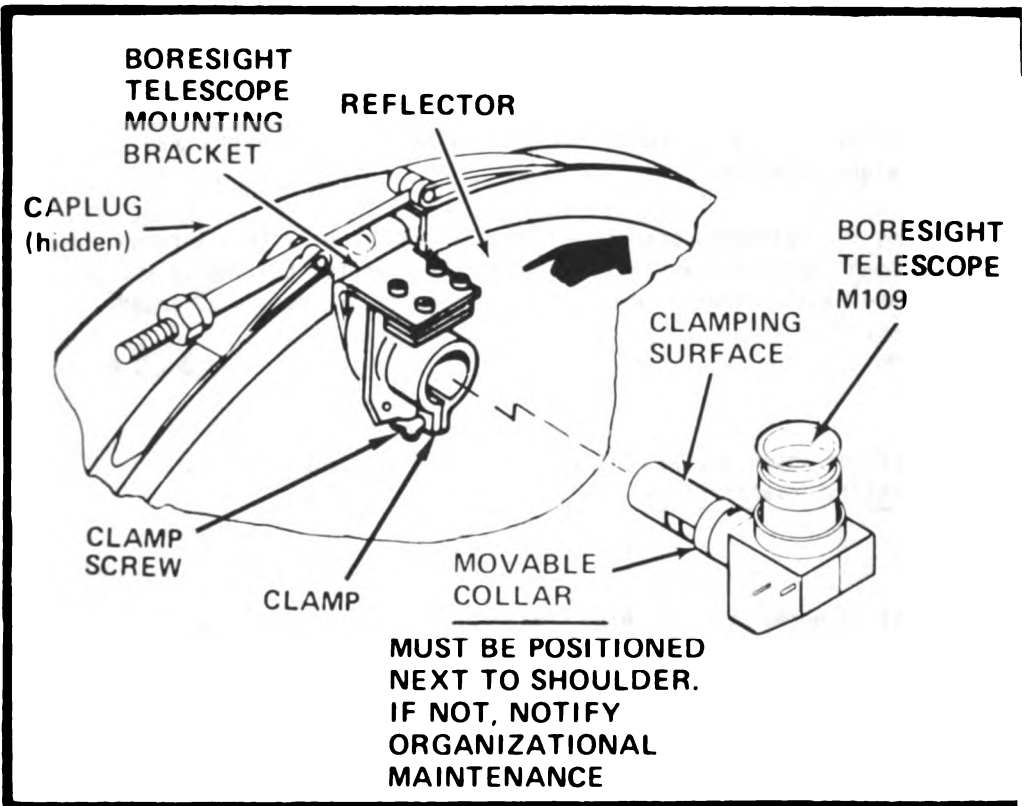
WARNING



DO NOT continue until the muzzle adapter has been removed from the cannon barrel. Ammunition will explode in the barrel if the adapter is not removed.



35. Remove the boresight telescope from the mandrel assembly. Install the boresight telescope in the telescope mounting bracket on the antenna. Remove the caplug from the front of the radome.



BORESIGHTING – Continued

TARGET METHOD – Continued

36. Verify that the M61A1 sight reticle is centered on the sight 5 mil aiming circle on the boresight target before the following steps.
37. Press and release ENTER pushbutton to terminate the E908 test setup. The VALUE display should show E909.
38. Press and release ENTER pushbutton. The VALUE display should show C999.

WARNING



When rotating locknut secured to the elevation input shaft, make very small adjustments to prevent the antenna from making sudden movements and endangering personnel.



39. Set the radar stow control (unit 6) MODE switch to NORMAL and MAINT switch to ON.

IMPORTANT: Any pressure on the antenna or telescope will cause boresighting error.

40. During the following procedure a second crewman will look through the boresight telescope and will instruct the operator to line up the crosshairs in azimuth and elevation on the radar antenna boresight target.

NOTE

If the antenna will not respond in the following setups, notify organizational maintenance.

NOTE

It is normal for the hand control to move the antenna at a slow rate during boresighting. This ensures greater boresighting accuracy.

41. Press the action switch and use the hand control to center the boresight telescope crosshairs in azimuth and elevation.

BORESIGHTING – Continued

TARGET METHOD – Continued

42. If the radar antenna target aiming point on the boresight target is in the center of the crosshairs in azimuth and elevation of the boresight telescope (± 0.5 mils), release the action switch and proceed to step 53.
43. If the antenna boresight cannot be obtained, continue with the following steps.
44. Press SELECT pushbutton. The VALUE display will show A _ _ _ (indicating azimuth will be displayed next).
45. Press SELECT pushbutton. The VALUE display shows azimuth offset value \pm XXX where "XXX" is the azimuth boresight value in 0.1 mil units from 000 (0 mil) to ± 999 (± 99.9 mils).
46. Press the action switch and use the hand control to zero (000 ± 10.0 mils) on the VALUE display. Release action switch.
47. Press SELECT pushbutton. The VALUE display will show E _ _ _ (indicating elevation will be displayed next).
48. Press SELECT pushbutton. The VALUE display shows elevation offset value \pm XXX where "XXX" is the elevation boresight value in 0.1 mil units from 000 (0 mil) to ± 999 (± 99.9 mils).
49. Press the action switch and use the hand control to zero (000 ± 10.0 mils) on the VALUE display. Release action switch.

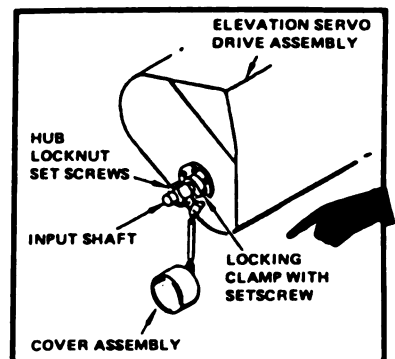


WARNING

When rotating the clamp locknut secured to the shaft, make very small adjustments to prevent the antenna from making sudden movements and endangering personnel.



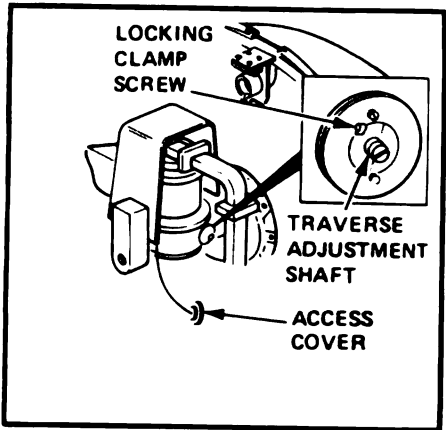
50. Remove the access cover from the elevation adjustment shaft located on the elevation servo drive assembly. Loosen the locking clamp screw and gradually turn clamp locknut secured to the elevation adjusting shaft to position the boresight telescope reticle on the radar antenna boresight target aiming cross ± 20 mils. Tighten the locking clamp screw and replace the access cover.



BORESIGHTING – Continued

TARGET METHOD – Continued

51. Remove the access cover from the traverse (azimuth) adjustment shaft located on the reflector and feed assembly. Loosen the locking clamp screw and gradually turn the traverse adjusting shaft until the vertical crosshair in the boresight telescope is positioned on the radar antenna boresight target ± 20 mils. Tighten the locking clamp screw and replace the access cover.



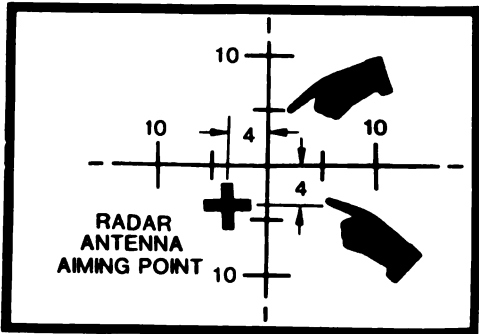
52. Press the action switch and use the hand control to center the boresight telescope crosshairs in azimuth and elevation on the radar antenna boresight target. When the boresight telescope crosshairs are centered, release action switch.

NOTE

If the antenna corrections label is missing, notify organizational maintenance.

ANTENNA CORRECTIONS	
SET HORIZ CROSS HAIR	<input type="text" value="4"/> MILS ABOVE AIMING POINT
SET HORIZ CROSS HAIR	<input type="text"/> MILS BELOW AIMING POINT
SET VERT CROSS HAIR	<input type="text"/> MILS LEFT OF AIMING POINT
SET VERT CROSS HAIR	<input type="text" value="4"/> MILS RIGHT OF AIMING POINT

53. Press the action switch and use the hand control to position the elevation boresight telescope reticle on the radar antenna cross as indicated by the antenna corrections label affixed to the antenna. Move the hand control in azimuth until the vertical crosshair in the boresight telescope reticle is positioned as indicated on the correction label. Release action switch.



EXAMPLE

BORESIGHTING – Continued

TARGET METHOD – Continued

NOTE

If you wish to record the boresight reading, perform steps 54 through 57; otherwise, proceed to step 58.

54. Press SELECT pushbutton. The VALUE display shows A _ _ _ (indicating azimuth will be displayed next).
55. Press SELECT. The VALUE display shows azimuth offset value \pm XXX where "XXX" is the azimuth boresight value in 0.1 mil units from 000 (0 mils) to \pm 999 (\pm 99.9 mils).
56. Press SELECT. The VALUE display shows E _ _ _ (indicating elevation will be displayed next).
57. Press SELECT. The VALUE display shows elevation offset value \pm XXX where "XXX" is the elevation boresight value in 0.1 mil units from 000 (0 mils) to \pm 999 (\pm 99.9 mils).

NOTE

If the antenna does not respond in the following steps, notify organizational maintenance.

58. Set the stow control MODE switch to STOW.
59. Using the stow control TRAV switch, drive the antenna approximately 10 degrees to the left. Set the stow control MODE switch to NORMAL. The antenna will reposition.
60. Look through the boresight telescope and check that the crosshairs are positioned as indicated on the antenna corrections label \pm 3 mils.
61. Set the stow control MODE switch to STOW.
62. Using the stow control TRAV switch, drive the antenna approximately 10 degrees to the right. Set the stow control MODE switch to NORMAL. The antenna will reposition.
63. Look through the boresight telescope and check that the crosshairs are positioned as indicated on the antenna corrections label \pm 3 mils.

BORESIGHTING – Continued

TARGET METHOD – Continued

64. Set the stow control MODE switch to STOW.
65. Using the stow control ELEV switch, drive the antenna up approximately 10 degrees. Set the stow control MODE switch to NORMAL. The antenna will reposition.
66. Look through the boresight telescope and check that the crosshairs are positioned as indicated on the antenna corrections label ± 3 mils.
67. Set the stow control MODE switch to STOW.
68. Using the stow ELEV switch, drive the antenna down approximately 10 degrees. Set the stow control MODE switch to NORMAL. The antenna will reposition.

NOTE

Verify that the boresight target radar aiming point is centered within 1 mil in the 5 mil sight reticle.

69. Look through the boresight telescope and check that the crosshairs are positioned as indicated on the antenna corrections label ± 3 mils.
70. Press and release the Enter pushbutton to update the boresighting data in the fire control processor. the VALUE display should return to E001. Perform off-line BIT set-up message E063 page 3-51. If a fault occurs repeat steps 22 through 76.
71. Set stow control MAINT switch to OFF. Remove the boresight telescope from the antenna and reassemble the borescope. Reinstall the caplug in front of the radome.
72. Set the MODE switch to RADAR, MAN, EXT or GRD mode and momentarily squeeze the ACTION switch to escape the TEST mode.
73. Cage the M61A1 sight and set the SYSTEM POWER switch to OFF.

BORESIGHTING – Continued

TARGET METHOD – Continued



WARNING



Check that the cannon muzzles are empty.

74. Place NORM-STATIC-TEST switch to STATIC and install the arming connector on the fire interrupter.
75. Set the DISPLAY/ENTRY switch to DISPLAY.
76. Set the BALLISTICS/BIT FUNCTION switch to OFF.

END

BORESIGHTING — Continued

DISTANT AIMING POINT METHOD

1. Emplace the gun system in a level unobstructed area if not done already. (See GUN EMPLACEMENT, page 2-40).
2. Set the GUN POWER switch to OFF and the NORM-STATIC-TEST switch to STATIC.
3. Unlock the elevation and azimuth drive brakes.
4. Remove the arming connector from the firing interrupter.

CAUTION

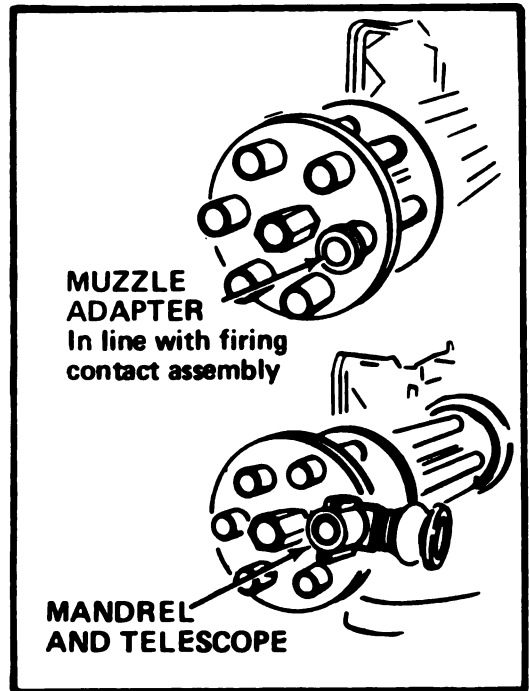
When rotating barrels manually,
rotate them slowly to prevent
damage to the index pin.

Ensure BRAKE-CLEAR AND BRAKE
switch is not used more than
10 seconds during any 1 minute
interval or damage to the
feeder solenoid may result.

5. Clear the cannon by holding the BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE and manually rotate cannon barrels slowly two complete revolutions. Remove any rounds in case chute.
6. Hold the BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE. Depress the cannon index pin and position the No. 1 barrel in the firing position at 4 o'clock as viewed from the muzzle end. Release the switch and index pin. Check that the pin has returned to its normal (out) position.

BORESIGHTING – Continued**DISTANT AIMING POINT METHOD – Continued**

7. Make sure that the mandrel and boresight telescope are properly assembled. Insert the assembly into the muzzle adapter with the eyepiece in a horizontal position to the left of the barrels. Press the mandrel assembly and adapter tightly into the muzzle of the No. 1 barrel in line with the firing contact.
8. Manually rotate the mount toward a distant aiming point at least 2500 meters away.



9. Set SYSTEM POWER to ON and uncage the sight. Set the MODE switch to TEST. Check that the sight reticle lights immediately. Adjust the control assembly SIGHT LAMP knob for a clear reticle in the sight.
10. Position the cannon so that a distinct feature of the distant aiming point is centered on the boresight telescope crosshairs.
11. Set the radar stow control (unit 6) MODE switch to NORMAL and the MAINT switch to OFF.

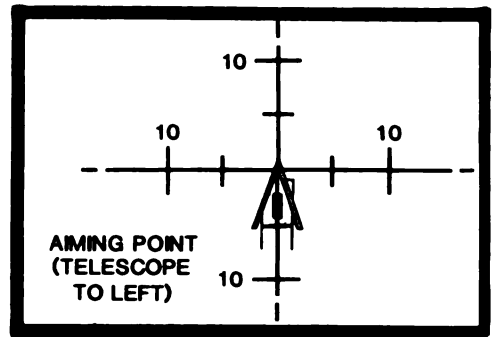
BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

NOTE

During sighting with a fixed target, always hold the cannon down and to the left to compensate for system backlash. If you overshoot the distant aiming point, return gun up and right and again apply down or left pressure until the reticle rests on the aiming point. Be certain to keep the boresight telescope crosshairs in the center of the boresight telescope field of view.

12. Hold cannon down and to the left. Sight through the boresight telescope and line up the crosshairs on the distant aiming point. Lock the elevation and azimuth drive brakes and check that the No. 1 firing barrel (with boresight telescope) is still centered on the distant aiming point. If not, unlock the brakes and repeat this step.



13. Hold cannon to the right and up by pushing (approximately 20 lbs) against the gun barrel. Release pressure, then sight through the boresight telescope to check that the crosshairs are displaced less than 4 mils (in either azimuth or elevation) from the distant aiming point.

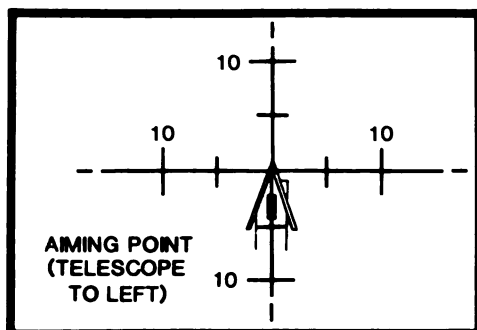
NOTE

If crosshairs are displaced more than 4 mils, discontinue boresighting procedure and notify organizational maintenance.

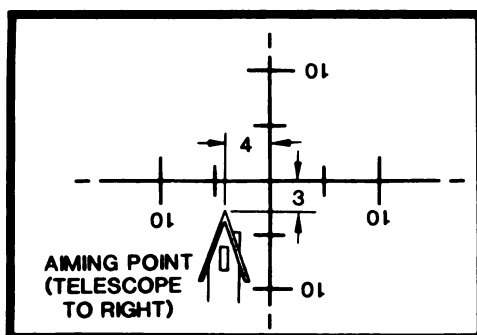
BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

14. Place pressure (approximately 20 lbs) on the end of the gun to return the gun down and left. With the boresight telescope and mandrel assembly to the left side of the gun, sight through the boresight telescope. The crosshairs should still be centered on the distant aiming point.

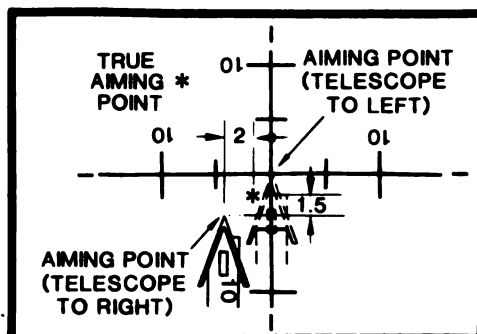


15. Rotate the boresight telescope and mandrel assembly (but NOT the muzzle adapter) 180 degrees to a horizontal position on the right side of the barrel. Sight through the boresight telescope and note where the crosshairs lie with respect to the distant aiming point.



If the crosshairs are displaced MORE than 5 mils from the distant aiming point, the boresight kit is defective. Replace boresight kit and repeat boresighting procedure.

If the crosshairs are displaced LESS than 5 mils, continue to use the boresight kit. Note the point halfway between the distant aiming point and the boresight telescope crosshairs. This point is the true aiming point. Note the position of the true aiming point with respect to the distant aiming point.



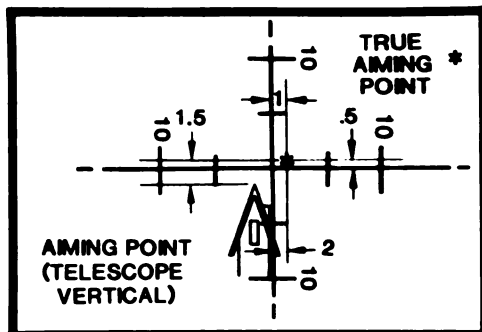
BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

16. Rotate the boresight telescope and mandrel assembly (but NOT the muzzle adapter) so that the eyepiece is in a vertical position.

NOTE

The boresight telescope crosshairs may shift to a new position in the vertical position. If so, note the position of the boresight telescope crosshairs with respect to the distant aiming point and the true aiming point.



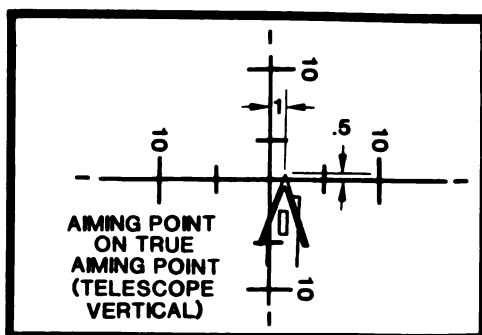
NOTE

When positioning the gun barrel, ensure that the final adjustment is always made using down and left pressure.

17. Set the elevation and azimuth drive brakes to OFF. Sight through the boresight telescope (still in the vertical position) and manually position the cannon so that the distant aiming point is centered on the true aiming point.

NOTE

Use the relative positions of the boresight telescope crosshairs, distant aiming point, and true aiming point noted in steps 17 and 18 to assist in determining correct cannon position.



BORESIGHTING – Continued**DISTANT AIMING POINT METHOD – Continued**

18. Lock the elevation and azimuth drive brakes and check that crosshairs have not moved.
19. Set the BALLISTICS/BIT FUNCTION switch to B (BIT) and the DISPLAY/ENTRY switch to ENTRY. The VALUE display should show E001 with digit 1 flashing, indicating that it is ready to be updated.
20. Enter E908 on the VALUE display using the SELECT and INCR pushbuttons. When you have E908 on the VALUE display, press and release the ENTER pushbutton. The VALUE display should show C999.
21. Remove any shock mount preset before boresighting by placing your hand on top of the sight and gently rocking the sight side-to-side and front-to-back (\pm 5 mils as indicated on the sight reticle).

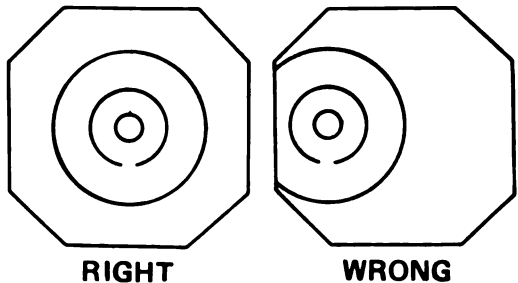
NOTE

The difference in the aiming point when the sight is pushed forward, back, left, and right then released should not exceed 3 mils for each direction pushed. If displaced more than 3 mils, notify organizational maintenance.

IMPORTANT: Prior to boresighting, pull sight back gently (5 mils) and release SLOWLY.

NOTE

Always view the M61A1 sight image so that the reticle is centered in the housing and combining glass.



22. If the distant aiming point is in the center of the 5 mil reticle of the M61A1 sight, no further boresight corrections are required. Proceed to step 30.

BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

23. A second crewman looks through the boresight telescope as adjustments are being made to make sure cannon does not move.

NOTE

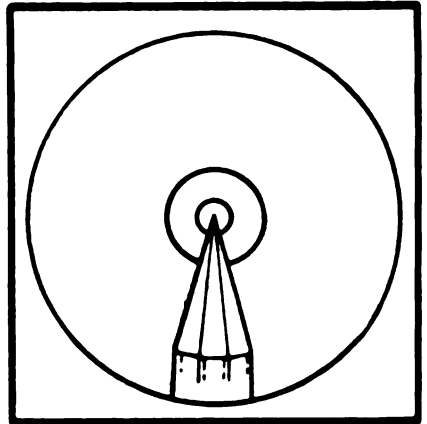
If the sight reticle will not move in the following steps, notify organizational maintenance.

It is normal for the hand control to move the sight reticle at a slow rate during boresighting. This ensures greater boresighting accuracy.

24. Press the action switch and use the hand control to center the reticle on the distant aiming point. Always keep the sight reticle in the center of the combining glass.
25. Release the action switch when the 5 mil sight reticle is centered on the distant aiming point (± 0.5 mil).

NOTE

If you wish to record the boresight reading, perform steps 26 through 29. Otherwise proceed to step 30.

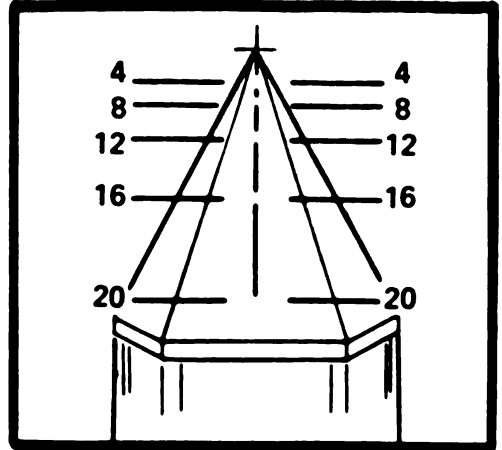
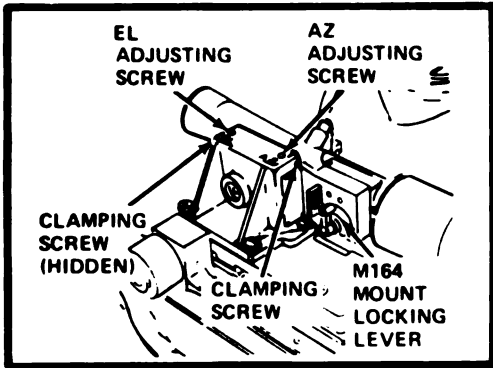


26. Press the SELECT pushbutton. The VALUE display shows A _ _ _ (indicating azimuth will be displayed next).
27. Press SELECT. The VALUE display shows the azimuth offset value \pm X X X where "X X X" is the azimuth boresight value in 0.1 mil units from 000 (0 mil) to ± 100 (± 10.0 mils).
28. Press SELECT. The VALUE display shows E _ _ _ (indicating elevation will be displayed next).
29. Press SELECT. The VALUE display shows the elevation offset value \pm X X X where "X X X" is the elevation boresight value in 0.1 mil units.

BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

30. If the M134 straight telescope is to be used, install it on the M164 mount. (See page 2-33.) Boresight the straight telescope as follows:
- Remove the lens cap from the M134 telescope. Loosen the elevation and azimuth clamping screws.
 - Look through the M134 telescope and adjust the azimuth and elevation adjusting screws until the cross in the reticle is aligned with the distant aiming point.
 - Tighten clamping screws and install lens cover.



31. If the AN/TVS-2B or AN/TVS-5 night sight is to be used, install it to the right of the M61A1 sight. (See page 2-90.) Boresight the night sight as follows:
- Position the cannon so that the cross of the M134 reticle is aligned with the distant aiming point.

BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

CAUTION

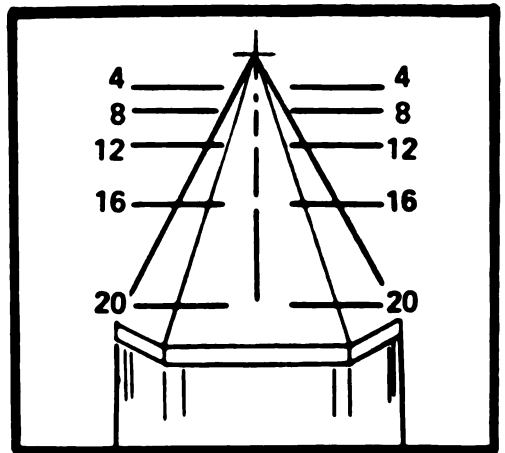
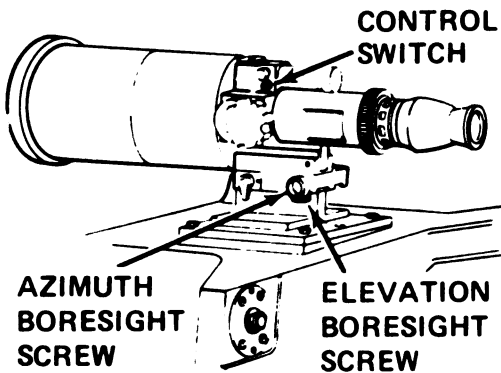
DO NOT remove the night sight lens cover in the daylight. DO NOT allow sun to shine directly into the lens aperture.

- Turn the night sight control switch to the SIGHT AND RETICLE position. Open the small aperture in the lens cover.
- Look through the night sight and turn the azimuth and elevation adjusting screws to align the night sight reticle with the distant aiming cross.
- Close the aperture and turn the night sight control switch to the OFF position.

WARNING



Always wait 5 minutes after turning off night sight before removing its batteries. A residual charge of approximately 45,000 volts exists after power is turned off.



BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

32. Remove the boresight telescope and mandrel assembly from the muzzle adapter then remove the muzzle adapter from the cannon barrel.

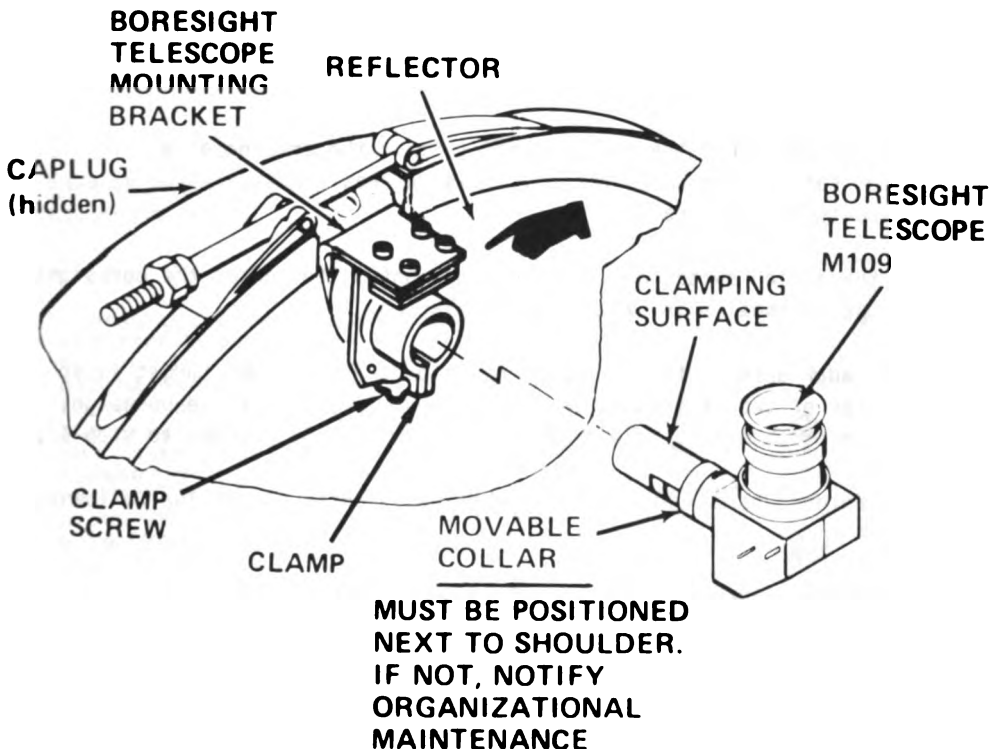


WARNING



DO NOT continue until the muzzle adapter has been removed from the cannon barrel. Ammunition will explode in the barrel if the adapter is not removed.

33. Remove the boresight telescope from the mandrel assembly. Install the boresight telescope in the telescope mounting bracket on the antenna. Remove the caplug from the front of the radome.



BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

34. Verify that the M61A1 sight reticle is centered on the distant aiming point before the following steps.
35. Press and release ENTER pushbutton to terminate the E908 test setup. The VALUE display should show E909.
36. Press and release ENTER pushbutton. The VALUE display should show C999.
37. Set the radar stow control (Unit 6) MODE switch to NORMAL and MAINT switch to ON.

IMPORTANT: Any pressure on the antenna or telescope will cause boresighting error.

38. During the following procedure a second crewman will look through the boresight telescope and will instruct the operator to line up the crosshairs in azimuth and elevation on radar antenna aiming point.

NOTE

If the antenna will not respond in the following setups, notify organizational maintenance.

NOTE

It is normal for the hand control to move the antenna at a slow rate during boresighting. This ensures greater boresighting accuracy.

39. Press the action switch and use the hand control to center the boresight telescope crosshairs in azimuth and elevation.
40. If the radar antenna target aiming point on the boresight target is in the center of the crosshairs in azimuth and elevation of the boresight telescope (±0.5 mils), release the action switch and proceed to step 51.
41. If the antenna boresight cannot be obtained, continue with the following steps.
42. Press SELECT pushbutton. The VALUE display will show A _ _ _ (indicating azimuth will be displayed next).
43. Press SELECT pushbutton. The VALUE display shows azimuth offset value ± XXX where "XXX" is the azimuth boresight value in 0.1 mil units from 000 (0 mil) to ±999 (±99.9 mils).

BORESIGHTING – Continued**DISTANT AIMING POINT METHOD – Continued**

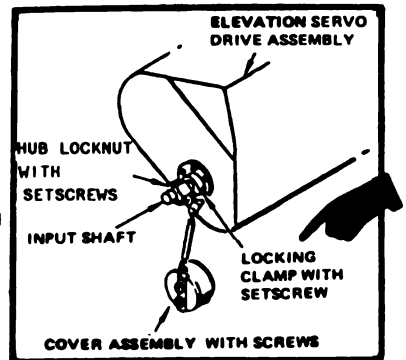
44. Press the action switch and use the hand control to zero (000 ± 10.0 mils) on the VALUE display. Release action switch.
45. Press SELECT pushbutton. The VALUE display will show E _ _ _ (indicating elevation will be displayed next).
46. Press SELECT pushbutton. The VALUE display shows elevation offset value \pm XXX where "XXX" is the elevation boresight value in 0.1 mil units from 000 (0 mil) to ± 999 (± 99.9 mils).
47. Press the action switch and use the hand control to zero (000 ± 10.0 mils) on the VALUE display. Release action switch.

**WARNING**

When rotating the clamp locknut secured to the elevation input shaft, make very small adjustments to prevent the antenna from making sudden movements and endangering personnel.

IMPORTANT: Any pressure on the antenna or telescope will cause boresighting error.

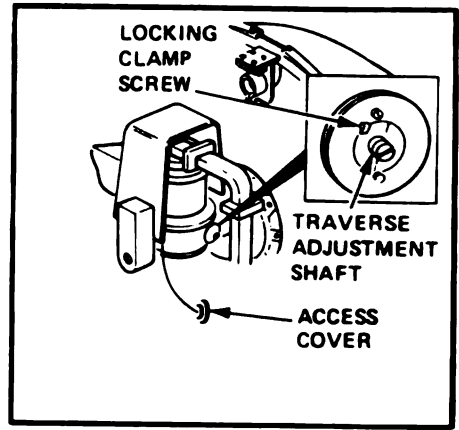
48. Loosen two access cover captive screws and remove the access cover from the hub locknut located on the input shaft of the elevation servo drive assembly. Loosen the locking clamp setscrew on the input shaft and gradually turn the hub locknut to position the boresight telescope reticle on the distant aiming point ± 20 mils. Tighten the locking clamp setscrew. Replace the access cover and tighten the two access cover captive screws.



BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

49. Remove the access cover from the traverse (azimuth) adjustment shaft located on the reflector and feed assembly. Loosen the locking clamp screw and gradually turn the traverse adjusting shaft until the vertical crosshair in the boresight telescope is positioned on the distant aiming point ± 20 mils. Tighten the locking clamp screw and replace the access cover.



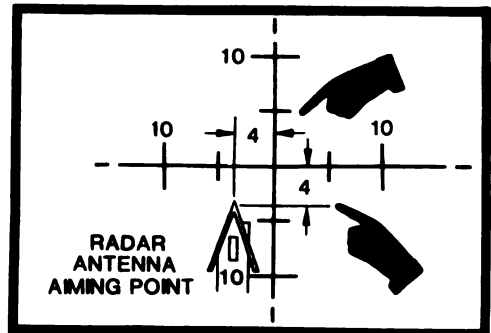
50. Press the action switch and use the hand control to center the boresight telescope crosshairs in azimuth and elevation on the radar antenna aiming point. When the boresight telescope crosshairs are centered, release action switch.

NOTE

If the antenna corrections label is missing, notify organizational maintenance.

ANTENNA CORRECTIONS			
SET HORIZ CROSS HAIR	<input type="text" value="4"/>	MILS ABOVE AIMING POINT	
SET HORIZ CROSS HAIR	<input type="text"/>	MILS BELOW AIMING POINT	
SET VERT CROSS HAIR	<input type="text"/>	MILS LEFT OF AIMING POINT	
SET VERT CROSS HAIR	<input type="text" value="4"/>	MILS RIGHT OF AIMING POINT	

51. Press the action switch and use the hand control to position the elevation boresight telescope reticle on the radar antenna cross as indicated by the antenna corrections label affixed to the antenna. Move the hand control in azimuth until the vertical crosshair in the boresight telescope reticle is positioned as indicated on the correction label. Release action switch.



EXAMPLE

BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

NOTE

If you wish to record the boresight reading, perform steps 52 through 55; otherwise, proceed to step 56.

52. Press SELECT pushbutton. The VALUE display shows A _ _ _ (indicating azimuth will be displayed next).
53. Press SELECT. The VALUE display shows azimuth offset value \pm XXX where "XXX" is the azimuth boresight value in 0.1 mil units from 000 (0 mils) to \pm 999 (\pm 99.9 mils).
54. Press SELECT. The VALUE display shows E _ _ _ (indicating elevation will be displayed next).
55. Press SELECT. The VALUE display shows elevation offset value \pm XXX where "XXX" is the elevation boresight value in 0.1 mil units from 000 (0 mils) to \pm 999 (\pm 99.9 mils).

NOTE

If the antenna does not respond in the following steps, notify organizational maintenance.

56. Set the stow control MODE switch to STOW.
57. Using the stow control TRAV switch, drive the antenna approximately 10 degrees to the left. Set the stow control MODE switch to NORMAL. The antenna will reposition.
58. Look through the boresight telescope and check that the crosshairs are positioned as indicated on the antenna corrections label \pm 3 mils.
59. Set the stow control MODE switch to STOW.
60. Using the stow control TRAV switch, drive the antenna approximately 10 degrees to the right. Set the stow control MODE switch to NORMAL. The antenna will reposition.
61. Look through the boresight telescope and check that the crosshairs are positioned as indicated on the antenna corrections label \pm 3 mils.
62. Set the stow control MODE switch to STOW.

BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

- 63. Using the stow control ELEV switch, drive the antenna up approximately 10 degrees. Set the stow control MODE switch to NORMAL. The antenna will reposition.
- 64. Look through the boresight telescope and check that the crosshairs are positioned as indicated on the antenna corrections label ± 3 mils.
- 65. Set the stow control MODE switch to STOW.
- 66. Using the stow ELEV switch, drive the antenna down approximately 10 degrees. Set the stow control MODE switch to NORMAL. The antenna will reposition.

BORESIGHTING – Continued

DISTANT AIMING POINT METHOD – Continued

NOTE

Verify that the distant aiming point is centered within 1 mil in the 5 mil sight reticle. If not, repeat the boresighting procedure beginning with step 7.

67. Look through the boresight telescope and check that the crosshairs are positioned as indicated on the antenna corrections label ± 3 mils.
68. Press and release the ENTER pushbutton to update the boresighting data in the fire control processor. The VALUE display should return to E001. Perform off-line BIT set-up message E063, page 3-51. If a fault occurs repeat steps 20 through 74.
69. Set stow control MAINT switch to OFF. Remove the boresight telescope from the antenna and reassemble the borescope. Reinstall the caplug in front of the radome.
70. Set the MODE switch to RADAR, MAN, EXT or GRD mode and momentarily squeeze the ACTION switch to escape the TEST mode.
71. Cage the M61A1 sight and set the SYSTEM POWER switch to OFF.



WARNING



Check that the cannon muzzles are empty.

72. Place the NORM-STATIC-TEST switch to NORM and install the arming connector on the firing interrupter.
73. Set the DISPLAY/ENTRY switch to DISPLAY.
74. Set the BALLISTICS/BIT FUNCTION switch to OFF.

END

CHANGING RADAR FREQUENCY

CHANGING RADAR FREQUENCY

To change the radar operating frequency, use the following procedure.

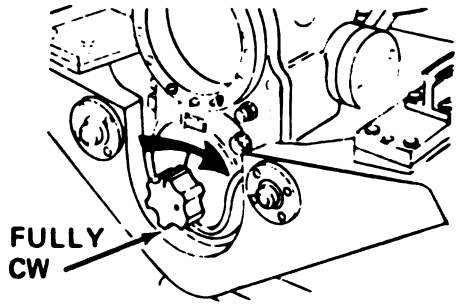
WARNING



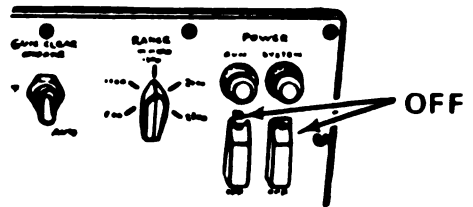
High voltage is present in receiver-transmitter when energized in standby or radiate condition. Death or injury can result from contact with this high voltage. Observe safety precautions.



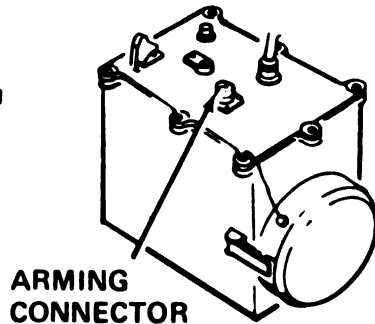
1. Turn knob on sight fully clockwise to cage sight.



2. Set control assembly GUN POWER and SYSTEM POWER switches to OFF.

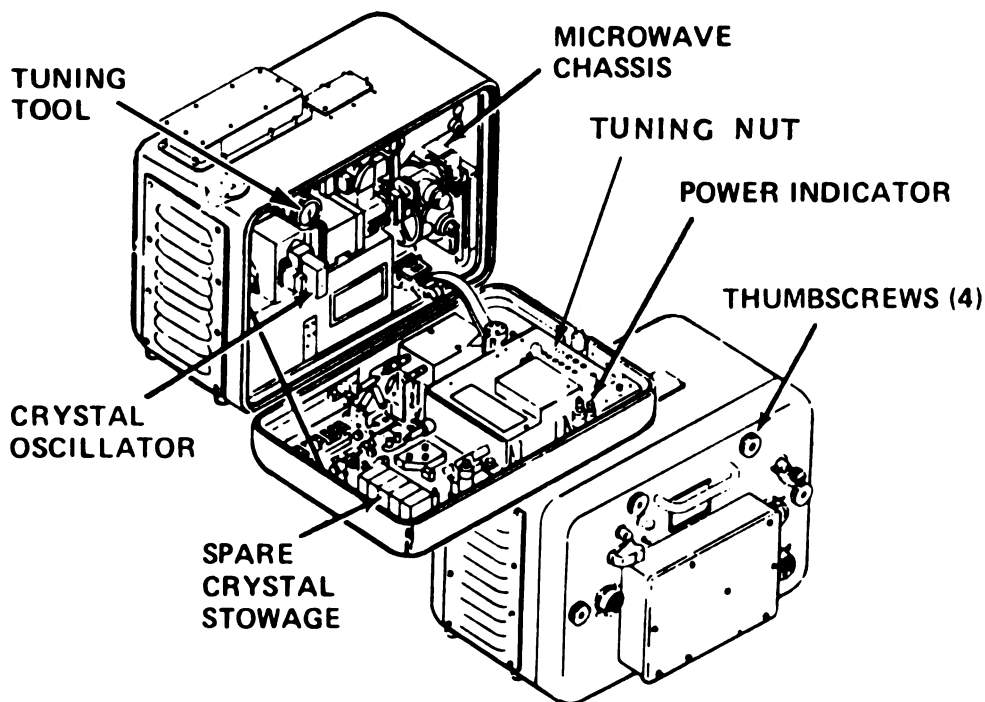


3. Remove arming connector from firing interrupter J2.



4. To gain access to receiver-transmitter remove quick-release fasteners and thumbscrews under baseplate, then remove cable guard.

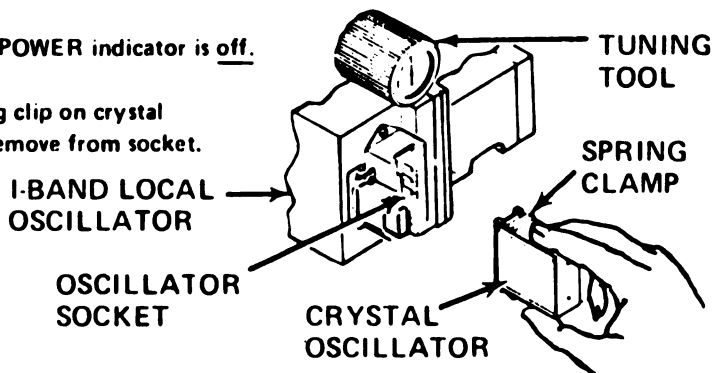
CHANGING RADAR FREQUENCY – Continued



5. On receiver-transmitter, loosen four thumbscrew fasteners and lower front panel.

6. Make sure that **POWER** indicator is off.

7. Compress spring clip on crystal oscillator and remove from socket.



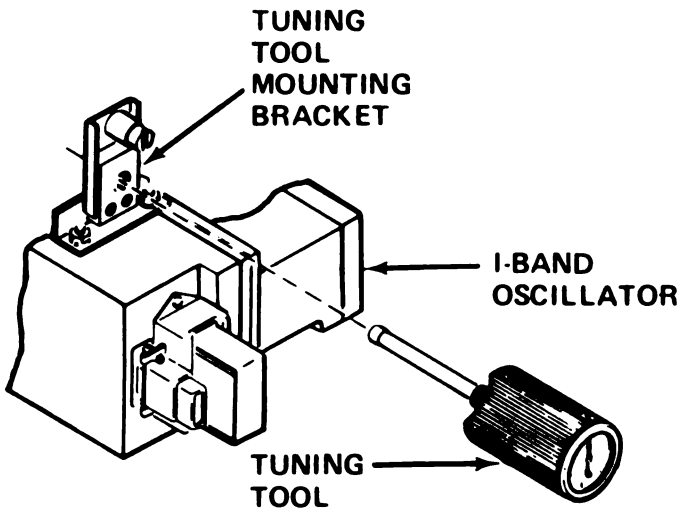
8. Select desired crystal oscillator from the spare crystals stowed in front panel. Crystal oscillators are listed as follows:

Part Number	Channel Number	Crystal Frequency (MHz)
10549175	1	9145
10549176	2	9153
10549177	3	9161
10549178	4	9169
10549179	5	9177
10548224	6	9185

CHANGING RADAR FREQUENCY – Continued

NOTE: Each crystal oscillator is marked with its respective part number, channel number, and frequency.

9. Line up the selected crystal oscillator with the socket and install.
10. Stow the crystal oscillator that was removed in the front panel spare crystal storage area.



11. Remove tuning tool from its mounting bracket by turning tool counterclockwise. Insert tuning tool into frequency adjuster mounted in cover of unit 2. Push down on the indicator until the hand stops moving. The correct reading for proper adjustment is 6. If this reading is not obtained, discontinue the tuning procedure and notify organizational maintenance.

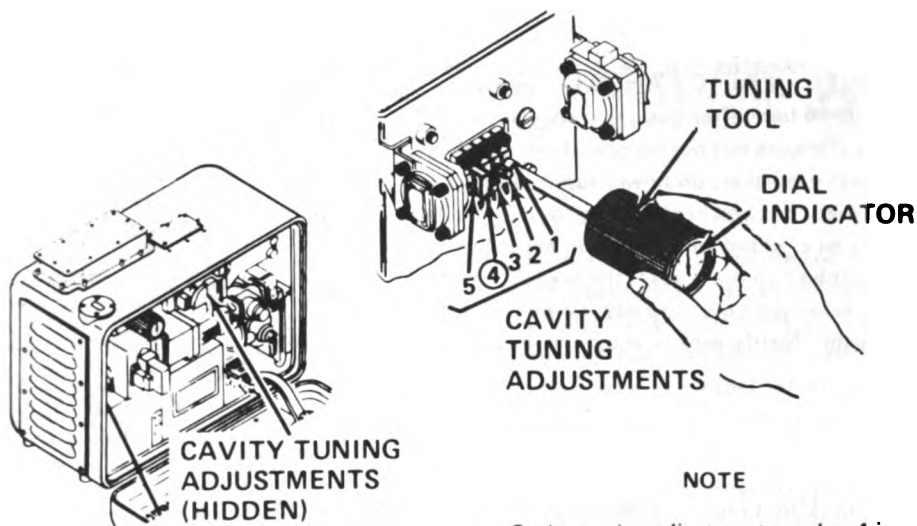
CAUTION

Turning the cavity adjustment screws hard against the stops will damage the klystron. Improper tuning of the klystron power amplifier can shorten the tube life.

NOTE

Clockwise movement of the tuning tool moves the indicator to lower frequencies. Counterclockwise movement of the tuning tool moves the indicator to higher frequencies.

CHANGING RADAR FREQUENCY – Continued



12. Push in on the tuning tool, check position of indicator, and carefully adjust cavity tuning adjustment 1, 2, 3, and 5 until pointer on dial indicator is positioned to channel 3. Then adjust cavities 1, 2, 3, and 5 until indicator is positioned to new operating frequency. The klystron is now course-tuned to new operating frequency

12.1 Place NORM-STATIC-TEST switch to STATIC.



WARNING

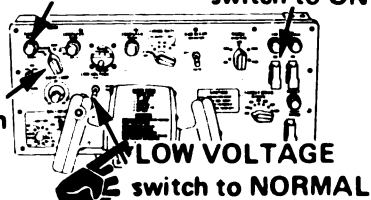
Be very careful during the following steps. High voltage will be present when the receiver-transmitter is energized.



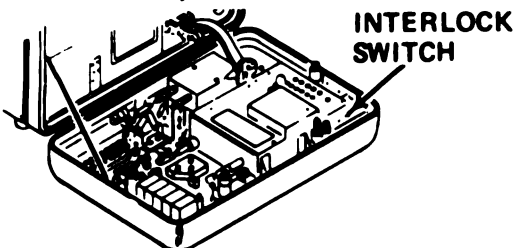
13. Set control assembly LOW VOLTAGE switch to NORMAL and SYSTEM POWER switch to ON. Uncage sight. Set MODE switch to RADAR.

READY WHEN LIT SYSTEM POWER switch to ON

MODE switch to RADAR

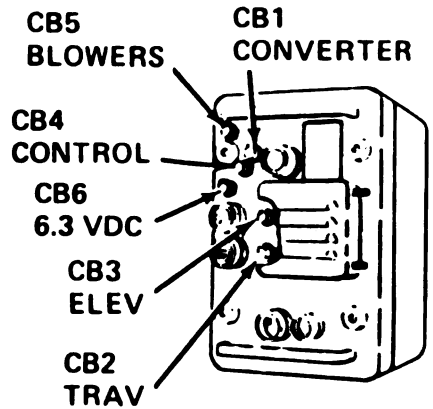


14. Pull receiver-transmitter interlock switch forward and out to service position. Receiver-transmitter is now energized. Wait until the READY WHEN LIT light goes on.

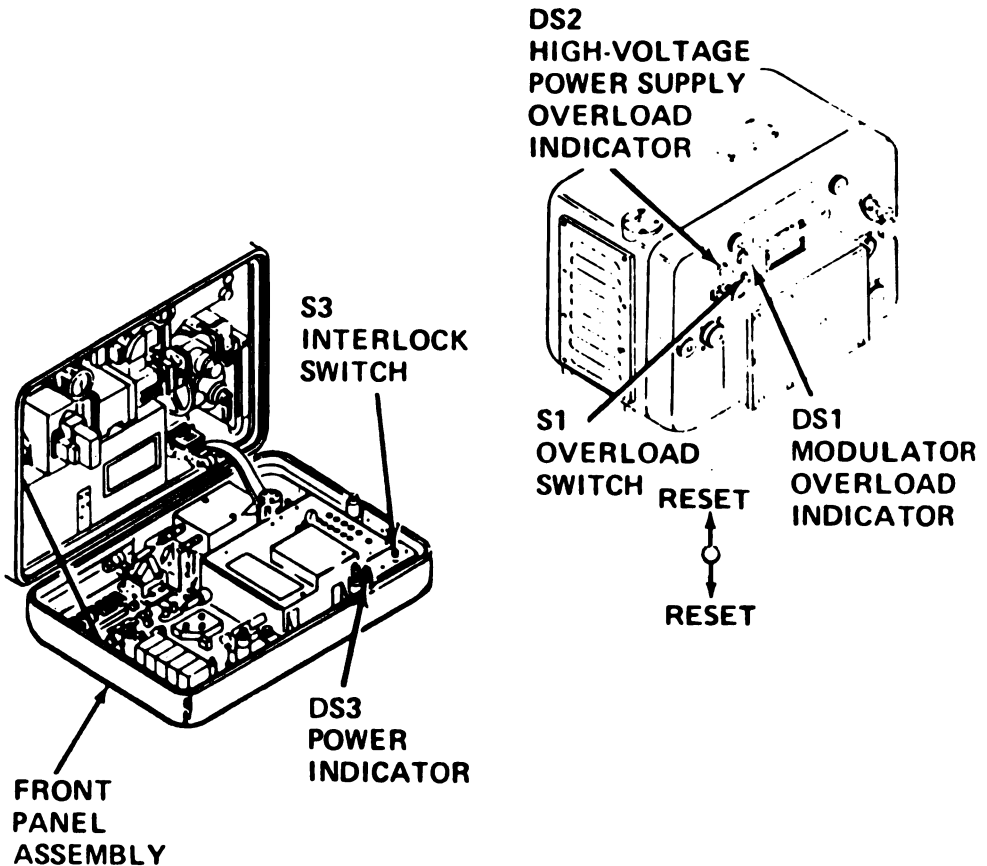


CHANGING RADAR FREQUENCY – Continued

NOTE: If **READY WHEN LIT** indicator fails to light after two minutes \pm 15 seconds, or if it goes out during operation, check all circuit breakers on power supply front panel. If a breaker has tripped, as indicated by an exposed white band on extended pushbutton shaft, reset the breaker. If the breaker trips immediately, do not reset it again. Notify organizational maintenance.



15. Check that receiver-transmitter **HIGH VOLTAGE SUPPLY OVERLOAD** and **MODULATOR OVERLOAD** indicators are not lit. If they are, momentarily set **OVERLOAD RESET** to **ON** to reset sensing circuit. If indicators continue to light, notify organizational maintenance.

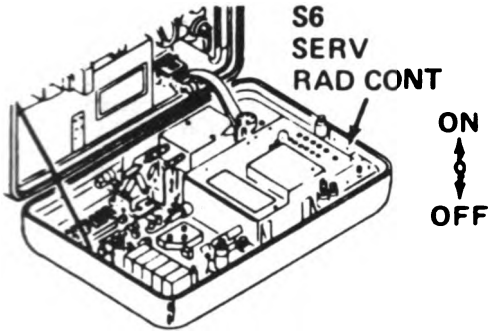


CHANGING RADAR FREQUENCY – Continued

WARNING



A potential radiation hazard exists when the radar antenna is energized. Keep everyone at least three feet away from front of the radiating feed horn in the antenna dish.



NOTE

When radar is energized to radiate and either of the receiver-transmitter overload indicators light, momentarily set OVERLOAD RESET switch to RESET (to reset overload sensing circuit). Do not reset more than two times. If overload continues, notify organizational maintenance.

NOTE

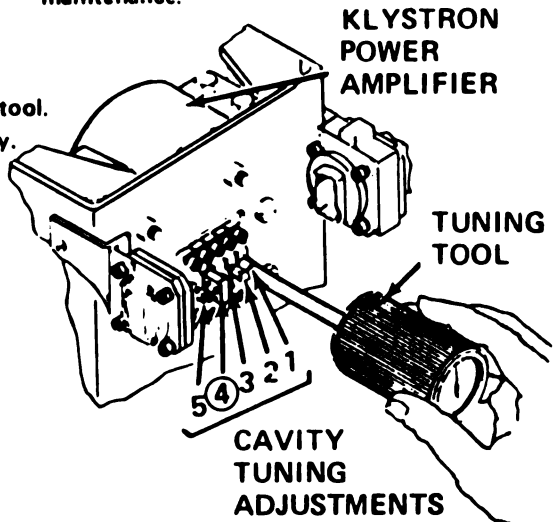
If HIGH VOLTAGE SUPPLY OVERLOAD and MODULATOR OVERLOAD indicators are not lit and the radar will not radiate, the +28 Vdc overload circuitry (light pipe) in the 2A2 may have tripped. To reset, turn SYSTEM POWER to OFF and then back ON. If radar will not radiate after two minutes, notify organizational maintenance.

CAUTION

Do not radiate at targets closer than 250 METERS. This will damage the radar.

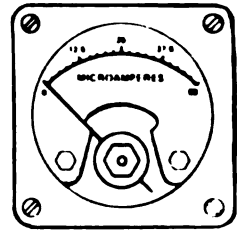
16. Set SERV RAD CONT switch to ON. Radar is now energized to radiate.
17. Fine tune the klystron power amplifier as follows:

IMPORTANT: Do not push in on tuning tool. This can damage the cavity.



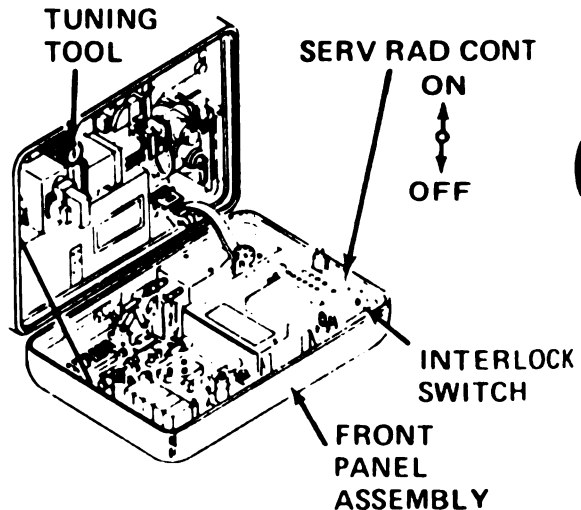
CHANGING RADAR FREQUENCY – Continued

- (a) Watch the RF POWER meter on the microwave chassis and adjust cavity number 3 to obtain a peak reading.
- (b) Detune cavity number 3 by turning adjustment counterclockwise until RF POWER meter reading decreases to approximately 50 percent of step (a) peak reading.
- (c) Peak cavities 1, 2, and 5 respectively to their peak RF POWER meter reading.
- (d) Carefully tune cavity 3 clockwise for a peak RF POWER meter reading.



RF POWER METER

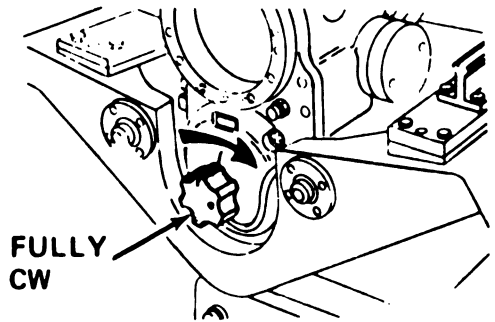
18. Set SERV RAD CONT switch to OFF.
19. Push in actuator of interlock switch to center position.
20. Replace tuning tool in mounting bracket. Turn tool clockwise until secure.



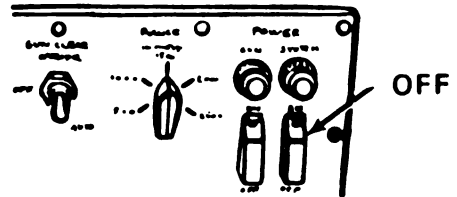
21. Raise receiver-transmitter front panel and secure with four thumbscrew fasteners. Place cable guard in place and secure with quick-release fasteners and thumb screws.

CHANGING RADAR FREQUENCY – Continued

22. Make sure that the sight is caged.



23. Set SYSTEM POWER switch to OFF.
Install arming connector in firing interrupter J2.



24. **IMPORTANT:** Make sure that all the daily Preventive Maintenance Checks and Services (PMCS) have been performed before firing (page 3-3).

SECTION VI .

ROUND INTERVAL MAINTENANCE

Round interval maintenance is based on the number of rounds cycled through the system or fired through the system. Because of this, an accurate record must be maintained in the logbook of all rounds cycled and all rounds fired.

CAUTION

Torque muzzle clamp to 600-650 in-lb
every 12,000 rounds fired.

Table 3-3.1

Sequence No.	Systems Rounds Interval	Items to be inspected or Procedure
#1	Every 12,000 fired	<u>Muzzle clamp bolt</u> : torque to 600-650 in-lb
2	Every 12,000 fired and/or cycled	<u>Declutching feeder</u> : notify organizational maintenance to replace feeder.
3	Every 18,000 fired and/or cycled	<u>Cannon, M168</u> : notify organizational maintenance for cannon servicing.
4	Every 24,000 fired and/or cycled	<u>Gun drive motor brake</u> : if barrel cluster rotates (600 in-lb min) notify organizational maintenance.
5	Every 36,000 fired and/or cycled	<u>Cannon, M168</u> : notify organizational maintenance for cannon servicing.
6	Every 36,000 fired and/or cycled	<u>Breechbolts</u> : notify organizational maintenance to rebuild.
7	Every 72,000 fired and/or cycled	<u>Breechbolts</u> : notify organizational maintenance to rebuild.
8	Every 72,000 fired and/or cycled	<u>Recoil adapters</u> : notify organizational maintenance to replace.
9	First 5,000 fired	<u>Barrels</u> : notify organizational maintenance to gage.
10	Every 72,000 fired and/or cycled	<u>Guide bar and pins</u> : notify organizational maintenance to replace.
11	Every 72,000 fired and/or cycled	<u>Feeder lock pins</u> : notify organizational maintenance to replace.
12	Every 108,000 fired and/or cycled	<u>Breechbolts</u> : notify organizational maintenance to rebuild.
13	Every 144,000 fired	<u>Cannon M168</u> : notify organizational maintenance to replace.

* These components are dependent on rounds fired only.

SECTION VII.

TROUBLESHOOTING

3-20 General. This section provides information useful in troubleshooting. Notify organizational maintenance of any test or inspection for which no corrective action is given. Table 3-4 lists malfunctions, tests or inspections, and corrective actions which you can perform. Tests or inspections should be performed in the order given. The following is a quick reference of troubleshooting procedures covered in the table:

SYMPTOM INDEX

AZIMUTH DRIVE

- Doesn't respond . . . 3-116

CANNON

- Can't be rotated using BRAKE-CLEAR AND BRAKE switch . . . 3-117
- Doesn't rotate with SYSTEM POWER and GUN POWER to ON . . . 3-117
- Doesn't clear . . . 3-119
- Misfires 3-119
- Has slow or erratic fire 3-119

ELEVATION DRIVE

- Doesn't respond . . . 3-116

FAULT MESSAGES 3-121

GUN POWER indicator

- Doesn't work 3-116

HEADSET

- No audio tone 3-120

HYDRAULIC SYSTEM

- Doesn't pump up . . . 3-115

LOW VOLTAGE WARNING

- indicator - Flashes . . . 3-116

RECEIVER-TRANSMITTER

POWER INDICATOR

- Doesn't light 3-120

ROUNDS - Don't fire 3-119

SIGHT RETICLE, M61A1

- Light doesn't work . . 3-120

SYSTEM POWER

indicator

- Doesn't work 3-115
- Interrupted 3-120

TROUBLESHOOTING - Continued

For corrective actions of malfunctions not listed in table 3-4, notify organizational maintenance.

IMPORTANT: Malfunction of the mount can be due to a dead battery. A battery check should be part of any malfunction checkout where electrical power is involved. Check to see if the LOW VOLTAGE WARNING indicator is lit, indicating fire control system power has been interrupted because of low voltage. The percentage load meter on the APU may also be used to determine the condition of the batteries. Recharge batteries if they are discharged.

IMPORTANT: Check that all cables are undamaged and properly connected and secured.

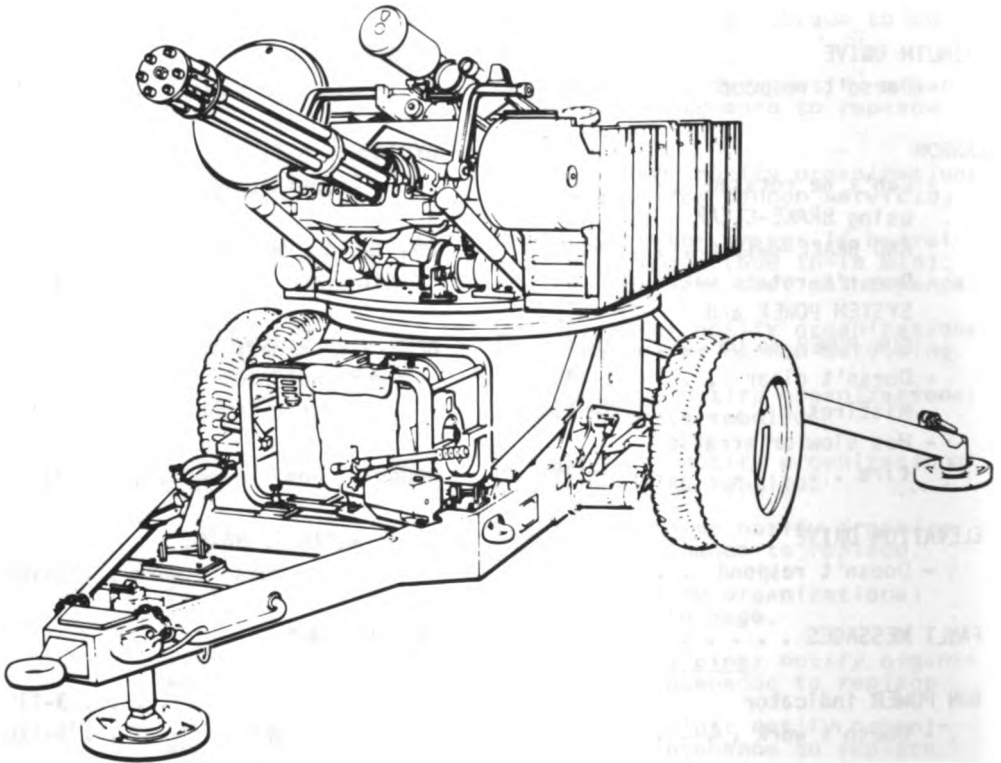


Table 3-4. Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. <u>Lower Carriage.</u>		
(1) Hydraulic system fails to pump up.		
→ Is fluid level low?	→	If so, add fluid. Refer to LO 9-1005-318-13.
→ Do hydraulic lines or connections leak?	→	If so, try to stop by tightening components. If leaks cannot be stopped by tightening, notify organizational maintenance.
→ Is pump valve rotated to DN position or not fully rotated to UP position?	→	If so, rotate fully clockwise to UP position.
2. <u>Upper Mount.</u>		
(1) Control panel SYSTEM POWER indicator fails to light when SYSTEM POWER switch is set to ON position with sight uncaged.		
→ Press indicator to test lamp.	→	If defective, replace lamp. (page 3-145)
→ Is blackout shutter opened?	→	If not, open blackout shutter.
CAUTION		
Do not reset a circuit breaker more than once. If circuit breaker fails to reset, notify organizational maintenance.		
→ Is SYS PWR circuit breaker on distribution box tripped?	→	If so, press circuit breaker to reset.

Table 3-4. Troubleshooting - Continued

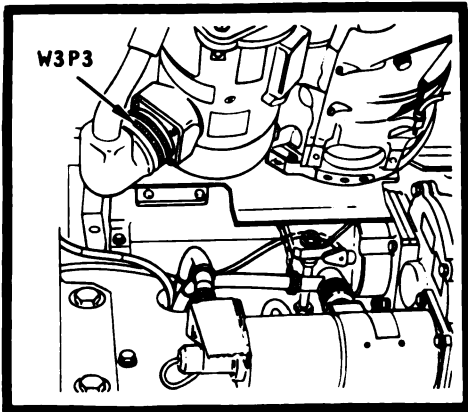
MALFUNCTION		
	TEST OR INSPECTION	CORRECTIVE ACTION
2. <u>Upper Mount - Continued.</u>		
	Are cables disconnected or loose?	If so, reconnect and/or tighten cable connections.
	Can SYSTEM POWER be turned ON by disconnecting A3P1 from W6J5 then installing shorting connector in W6J5?	If so, leave shorting connector in place and notify organizational maintenance.
	Are batteries discharged?	If so, recharge batteries (page 3-133).
(2) Both azimuth and elevation drives fail to respond when action switch is depressed and elevation and azimuth controls are rotated.		
	Is ACQ/TRK button being depressed simultaneously with the handles?	If not, depress ACQ/TRK simultaneously with the action switch and retry.
	Is distribution box NORM-STATIC-TEST set to NORM?	If not, set switch to NORM.
	Is control panel SYSTEM POWER switch set to ON with sight uncaged?	If not, set switch to ON position and uncage sight.
(3) LOW VOLTAGE WARNING indicator flashes or stays lit when LOW VOLTAGE switch is set to NORMAL.		
	Are batteries low?	If so, recharge batteries (page 3-133).
3. <u>Cannon.</u>		
(1) GUN POWER indicator fails to light when GUN POWER switch is set to ON.		
	Is control panel SYSTEM POWER switch set to ON with sight uncaged?	If not, set SYSTEM POWER switch to ON and uncage sight.

Table 3-4. Troubleshooting - Continued

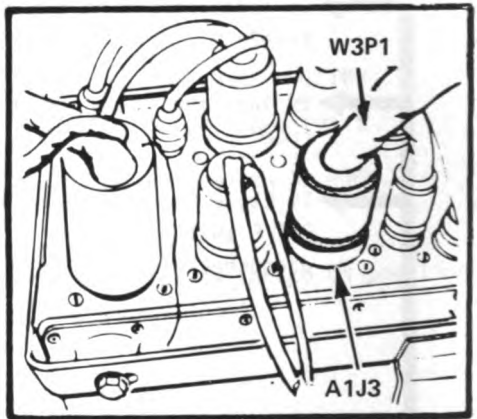
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. <u>Cannon - Continued.</u>		
	Press indicator to test lamp.	If defective, replace lamp (page 3-145).
	Is blackout shutter opened?	If not, open blackout shutter.
(2) Gun cannot be rotated with BRAKE-CLEAR AND BRAKE switch set to CLEAR AND BRAKE position.		
	Are all bolt assemblies installed correctly (one per rotor track)?	If not, notify organizational maintenance.
	Is indexing pin on cannon free?	If not, free indexing pin (page 2-3).
	Is indexing pin on feeder free?	If not, free indexing pin (page 2-3).
	Is cable to BRAKE-CLEAR AND BRAKE switch loose or disconnected?	If so, connect or tighten.
	CAUTION	
	Do not reset a circuit breaker more than once. If a circuit breaker fails to reset, notify organizational maintenance.	
	Is SYS PWR circuit breaker on distribution box tripped?	If so, press circuit breaker to reset.
	Is connector W3P3 on gun drive assembly and/or W3P1 on distribution box loose or disconnected?	If so, connect and/or tighten connector W3P1 and /or W3P3 (page 3-118).
(3) SYSTEM POWER and GUN POWER indicators light but cannon fails to rotate.		

Table 3-4. Troubleshooting - Continued

MALFUNCTION	
TEST OR INSPECTION	CORRECTIVE ACTION
3. Cannon - Continued.	
Is arming connector or arm-safe cable installed on firing interrupter?	If not, install arming connector or arm-safe cable on firing interrupter (page 2-10 or 2-21).
Is arm-safe switch depressed (when used)?	If not, depress arm-safe switch (page 2-21).
Is connector W3P3 on gun drive assembly and/or W3P1 on distribution box loose or disconnected?	If so so, connect and/or tighten connector W3P1 and/or W3P3.



GUN DRIVE ASSEMBLY



DISTRIBUTION BOX

WARNING



Clear cannon of all rounds before working on any part of firing mechanism. If cannon cannot be cleared, keep it positioned in a direction so that possible loss of life or damage to property will not result if ammunition cook-off should occur.



Table 3-4. Troubleshooting - Continued

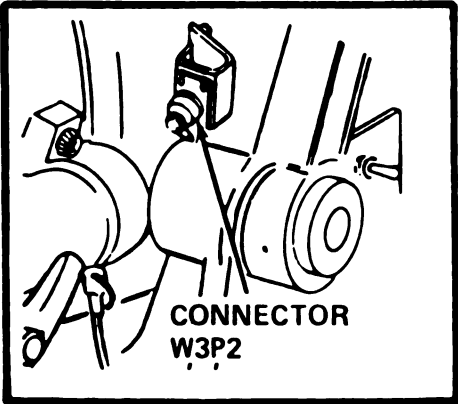
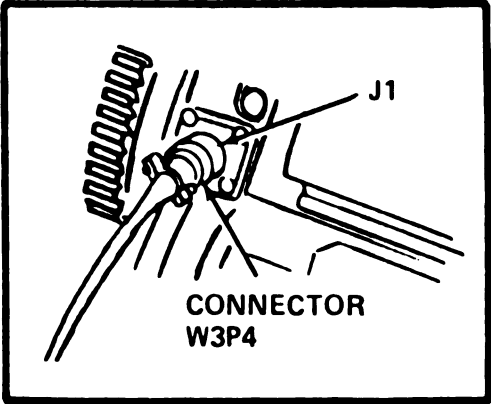
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. Cannon - Continued.		
(4) Cannon rotates; rounds feed through but do not fire.	Is firing connector W3P2 connected to firing contact assembly?	If not, connect W3P2 to firing contact assembly.
 <p>CONNECTOR W3P2</p>		
FIRING CONTACT ASSY		
 <p>CONNECTOR W3P4</p> <p>J1</p>		
FEEDER CONNECTION		
(5) Cannon fires normally but does not clear with GUN CLEAR switch in AUTO or OPERATOR position.	Is connector W3P4 connected to feeder?	If not, connect W3P4 to feeder connector J1.
(6) Cannon misfires.	Are breech bolt assemblies damaged?	If so, replace bolt assemblies (page 3-140).
(7) Slow or erratic rate of fire.	Is cannon lubricated?	If not, clean and lubricate cannon (page 3-135).

Table 3-4. Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. Cannon - Continued.		
Is ammo binding in storage can?		If so, reload storage can (page 2-27).
Are batteries discharged?		If so, recharge batteries (page 3-133).
Is APU output correct?		If not, adjust APU output (page 3-134).
4. Sighting and Fire Control.		
(1) POWER indicator lamp in receiver-transmitter does not light when radar is energized to STANDBY with INTERLOCK switch placed in SERVICE position.		If defective replace lamp (page 3-147).
(2) M61A1 sight reticle lamp does not light.		If so, tighten cable connector.
Is cable connection loose?		
Is VOLTAGE CONVERTER PWR circuit breaker on system distribution box tripped?		If so, press circuit breaker to reset.
(3) Unable to obtain audio tone during clutter lockon test.		Replace headset.
(4) Power to converter, sight gyros, radar, and fire control processor cannot be restored by caging sight before turning SYSTEM POWER to ON.	Can SYSTEM POWER be turned on by disconnecting A3P1 from W6J5 and then installing shorting connector in W6J5?	If so, leave shorting connector in place and notify organizational maintenance.

Table 3-4. Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. System Fault Messages.		
(1) F001 thru F016		Verify test setup. Repeat test. If fault continues, notify organizational maintenance.
(2) F017 FAULT lamp not lit.	<div> <div>Press indicator to test lamp.</div> <div>If lamp is good.</div> </div>	If defective, replace lamp.
		Notify organizational maintenance.
(3) F018 COMPUTER GOOD lamp not lit.	<div> <div>Press indicator to test lamp.</div> <div>If lamp is good.</div> </div>	If defective, replace lamp.
		Notify organizational maintenance.
(4) F019 READY-TO-FIRE lamp not lit.	<div> <div></div> <div>If lamp is good.</div> </div>	Replace lamp.
		Notify organizational maintenance.
(5) F020 TRACK/JAM/RADIATE lamp not lit.	<div> <div></div> <div>If lamp is good.</div> </div>	Replace lamp.
		Notify organizational maintenance.
(6) F021 thru F024		Notify organizational maintenance.
(7) F025 COMPUTER POWER lamp lit.	<div> <div></div> <div></div> </div>	Notify organizational maintenance.
		If not, press indicator to test lamp. If lamp is good, notify organizational maintenance.
(8) F026 thru F033		Notify organizational maintenance.

Table 3-4. Troubleshooting - Continued

MALFUNCTION		TEST OR INSPECTION	CORRECTIVE ACTION
(9) F032		Execute Setup messages E037 thru E050, then E001.	If fault continues, notify organizational maintenance.
(10) F033			Notify organizational maintenance.
(11) F034		COMPUTER POWER lamp not lit.	
		Press indicator to test lamp.	If defective, replace lamp.
		If lamp is good.	Notify organizational maintenance.
(12) F035 thru F038			Notify organizational maintenance.
(13) F039		Execute Setup messages E037 thru E050, then E001.	If fault continues, notify organizational maintenance.
(14) F040		Execute Setup messages E037 thru E050, then E001.	If fault continues, notify organizational maintenance.
(15) F041 thru F042			Notify organizational maintenance.

Table 3-4. Troubleshooting – Continued

MALFUNCTION

→ **TEST OR INSPECTION** → **CORRECTIVE ACTION**

(16) F043 Connector W3P1.

**WARNING**

To prevent firing during this test, perform each of the following instructions:

Connected to
receptacle A1J3 on
distribution box?

Disconnect connector W3P1 from receptacle A1J3 on distribution box. Set firing interrupter switch to OFF. Connect arming connector to A7J2 on firing interrupter.

Not connected to
receptacle A1J3 on
distribution box?

Notify organizational maintenance.

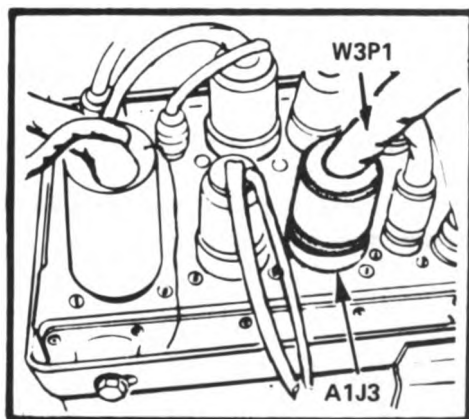
**DISTRIBUTION BOX**

Table 3-4. Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. System Fault Messages - Continued.		
(17) F044		Notify organizational maintenance.
(18) F045 System battery A4A3.		
	Needs charging?	If so, recharge system battery.
	AMPS meter on APU does not indicate 20% load or less in 30 minutes?	Discontinue charging and notify organizational maintenance.
(19) F046 Gun battery A4A1.		
	Needs charging?	If so, recharge gun battery.
	AMPS meter on APU does not indicate 20% load or less in 30 minutes?	Discontinue charging and notify organizational maintenance.
(20) F047 Gun battery A4A1.		
	Needs charging?	If so, recharge gun battery.
	AMPS meter on APU does not indicate 20% load or less in 30 minutes?	Discontinue charging and notify organizational maintenance.

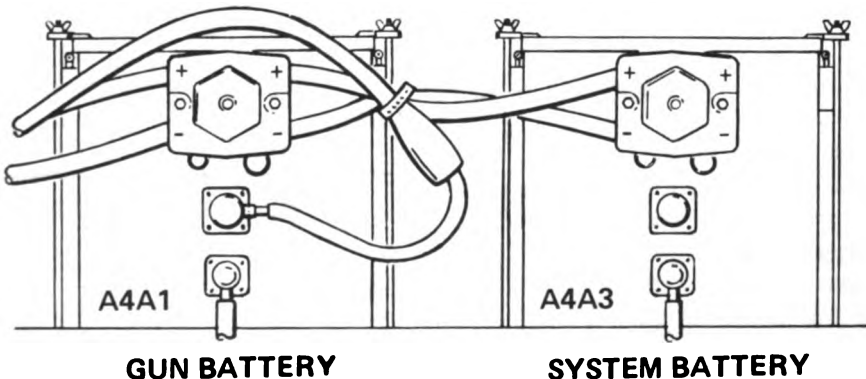


Table 3-4. Troubleshooting - Continued

MALFUNCTION5. System Fault Messages - Continued.

(21) F048 thru F076 → Notify organizational maintenance.

(22) F077 Check setup for error and repeat test. → If fault continues, notify organizational maintenance.

(23) F078 Connector W3P1.

**WARNING**

The cannon will be operational after the following step:

Not connected to receptacle A1J3 on distribution box?

→ Connect connector W3P1 to receptacle A1J3 on distribution box.

Connected to receptacle A1J3 on distribution box?

→ Notify organizational maintenance.

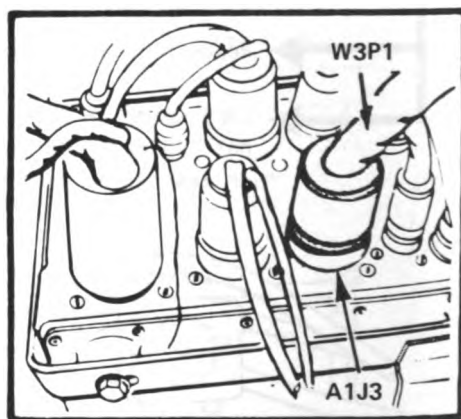
**DISTRIBUTION BOX**

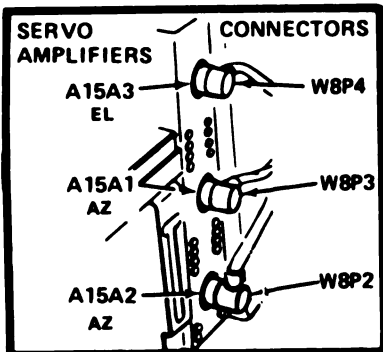
Table 3-4. Troubleshooting - Continued

MALFUNCTION**TEST OR INSPECTION****CORRECTIVE ACTION****5. System Fault Messages - Continued.**

(24) F079 thru F083 → Notify organizational maintenance.

(25) F084 Azimuth drive responds when action switch is depressed, but elevation drive does not respond or has uncontrolled response.

Are servo amplifier connectors disconnected or loose?



If so, connect or tighten.

If not, set NORM-STATIC-TEST switch to STATIC. Disconnect W8P3 from A15A1. Disconnect W8P4 from A15A3. Connect W8P4 to A15A1 for temporary correction of elevation problem and operation at reduced azimuth slew speed set NORM-STATIC-NORM TEST switch to NORM. Repeat test setup. If fault continues, notify organizational maintenance.

(26) F085 thru F087 → Notify organizational maintenance.

(27) F088 Elevation drive responds when action switch is depressed, but azimuth drive has a limited response.

Are servo amplifier connectors disconnected or loose?

If so, connect or tighten.

If not, set NORM-STATIC-TEST switch to STATIC. Disconnect W8P3 from A15A1 for temporary correction of azimuth problem and operation at reduced azimuth slew speed set NORM-STATIC-TEST switch to NORM. Repeat test setup. If fault continues, notify organizational maintenance.

Table 3-4. Troubleshooting - Continued

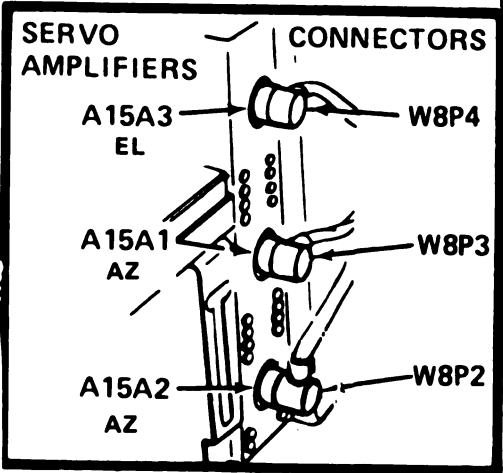
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. <u>System Fault Messages - Continued.</u>		
(28) F089		Notify organizational maintenance.
(29) F090 Elevation drive responds when action switch is depressed, but azimuth drive has a limited response.	Are servo amplifier connectors disconnected or loose?	<p>If so, connect or tighten.</p> <p>If not, set NORM-STATIC-TEST switch to STATIC. Disconnect W8P2 from A15A2 for temporary correction of azimuth problem and operation at reduced speed set NORM-STATIC-TEST switch to NORM. Repeat test setup. If fault continues, notify organizational maintenance.</p>
		
(30) F091 thru F096		Notify organizational maintenance.
(31) F097 Check gun and turret for obstruction which might prevent movement.		If no obstruction found, notify organizational maintenance.

Table 3-4. Troubleshooting - Continued

MALFUNCTION

TEST OR INSPECTION

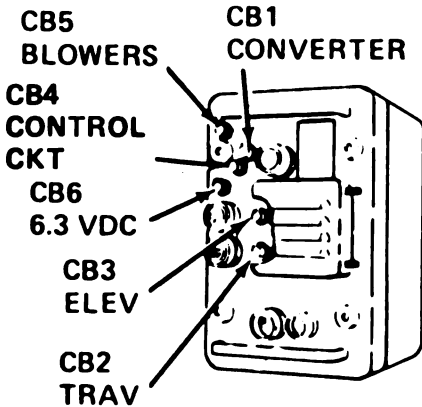
CORRECTIVE ACTION

5. System Fault Messages - Continued.

(32) F098 Is 5CB1 CONVERTER or 5CB4 CONTROL CKT circuit breakers on the radar power supply tripped? → If so, press circuit breakers to reset. Repeat test. If fault continues, notify organizational maintenance.

(33) F099 Is 5CB5 BLOWER circuit breaker on the radar power supply tripped? → If so, press circuit breaker to reset. Repeat test. If fault continues, notify organizational maintenance.

→ If not, notify organizational maintenance.



(34) F100 → Notify organizational maintenance.

(35) F101 Is 5CB1 CONVERTER, 5CB4 CONTROL CKT, or 5CB5 BLOWER circuit breakers on the radar power supply tripped? → If so, press circuit breakers to reset. Repeat test. If fault continues, notify organizational maintenance.

(36) F102 Is cover on the radar receiver-transmitter secure? → If so, notify organizational maintenance.

(37) F103 Is 5CB1 CONVERTER circuit breaker on the radar power supply tripped? → If so, press circuit breaker to reset. Repeat test. If fault continues, notify organizational maintenance.

Table 3-4. Troubleshooting - Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

5. System Fault Messages - Continued.

(38) F104 thru F116 → Notify organizational maintenance.

(39) F117 Klystron power amplifier.

Has low output?

Check klystron power amplifier tuning.

If tuned properly, notify organizational maintenance.

Has no output?

Crystal oscillator subassembly may be defective. Change radar frequency if situation permits.

(40) F118 → Notify organizational maintenance.

(41) F119 External range control assembly defective. → Replace. If fault continues, notify organizational maintenance.

(42) F120 External range control assembly defective. → Replace. If fault continues, notify organizational maintenance.

(43) F121 thru F123 → Notify organizational maintenance.

(44) F201 Execute setup messages E060, E061 and E062 → If fault continues, notify organizational maintenance.

(45) F401 thru F432 → Notify organizational maintenance.

(46) F433 Execute setup message E062 → If fault continues, notify organizational maintenance.

(47) F450 thru F463 → Notify organizational maintenance.

Table 3-4. Troubleshooting - Continued

MALFUNCTION

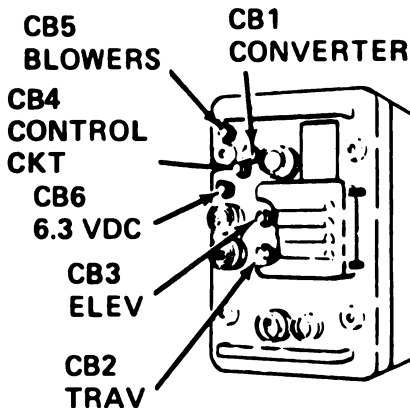
TEST OR INSPECTION

CORRECTIVE ACTION

5. System Fault Messages - Continued.

- (48) F502 Is MODE switch at NORMAL and MAINT switch to OFF on the stow control? → If not, set MODE to NORMAL and MAINT to OFF.
- Is 5CB2 TRAV circuit breaker on the radar power supply tripped? → If so, press circuit breaker to reset. Repeat test. If fault continues, notify organizational maintenance.

- (49) F503 Is MODE switch at NORMAL and MAINT switch to OFF on the stow control? → If not, set MODE to NORMAL and MAINT to OFF.
- Is 5CB3 ELEV circuit breaker on the radar power supply tripped? → If so, press circuit breaker to reset. Repeat test. If fault continues, notify organizational maintenance.



- (50) F504 thru F505 → Notify organizational maintenance.
- (51) F507 thru F510 → Notify organizational maintenance.
- (52) F511 Is 5CB6, 6.3VDC, circuit breaker on the radar power supply tripped? → If so, press circuit breaker to reset. Repeat test. If fault continues, notify organizational maintenance.

Table 3-4. Troubleshooting - Continued

MALFUNCTION

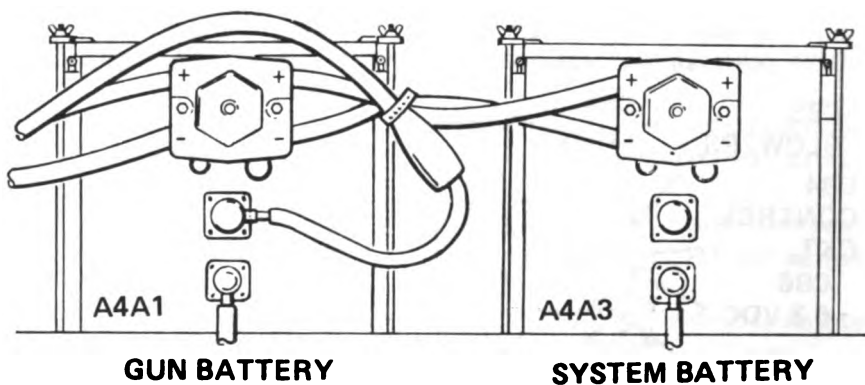
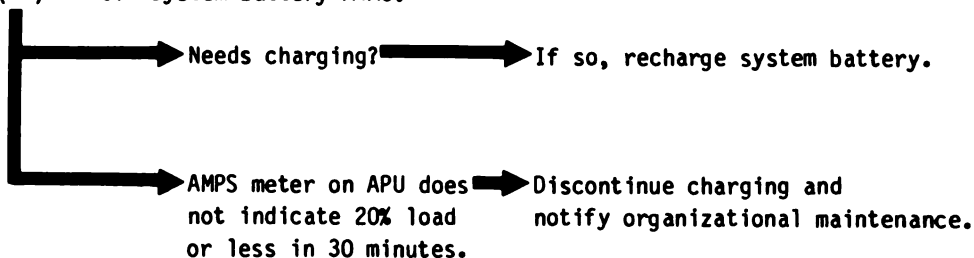


5. System Fault Messages - Continued.

(53) F600 thru F612 → Notify organizational maintenance.

(54) F700 → Notify organizational maintenance.

(55) F701 System battery A4A3.



(56) F702 Is sight uncaged? → If so, cage sight and repeat test. If fault continues, notify organizational maintenance.

(57) F703 and F704 → Notify organizational maintenance.

(58) F707 Is sight uncaged? → If so, execute setup message E001. If fault continues, notify organizational maintenance.

END

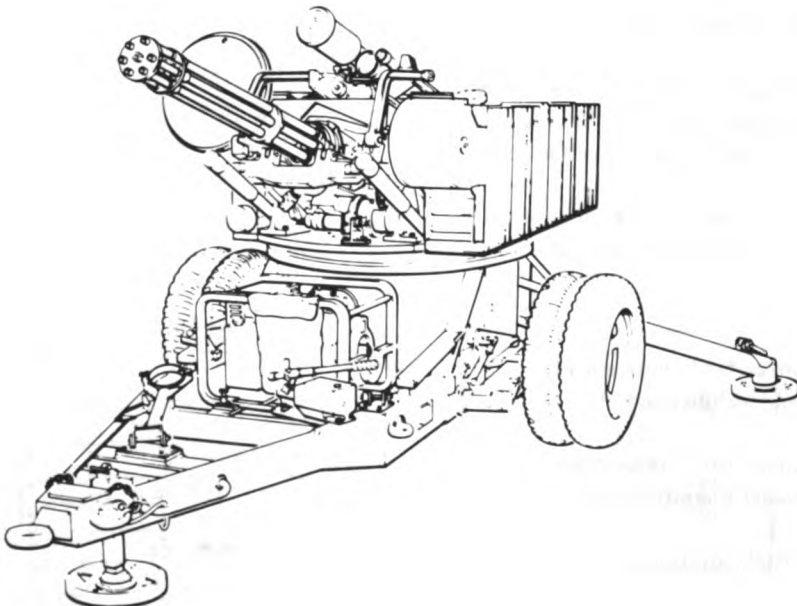
SECTION VIII.

CORRECTIVE MAINTENANCE

3-21 General. This section contains corrective maintenance procedures that you can perform. When performing any kind of maintenance, always observe the general procedures at the beginning of chapter 3, section IV.

PROCEDURE INDEX

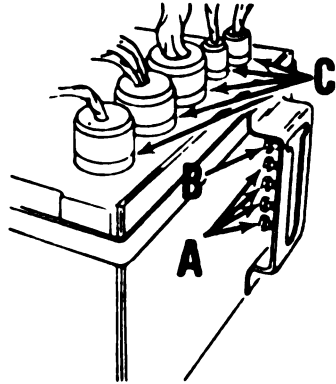
Air Filters	
Power Supply	3-149
Receiver-Transmitter	3-148
Antenna	3-150
Batteries	3-133
Cannon	3-135
Control Assembly	3-145
Declutching Feeder	3-132
Distribution Box	3-132
Receiver-Transmitter	3-147
Sight	3-146



DISTRIBUTION BOX

Inspection

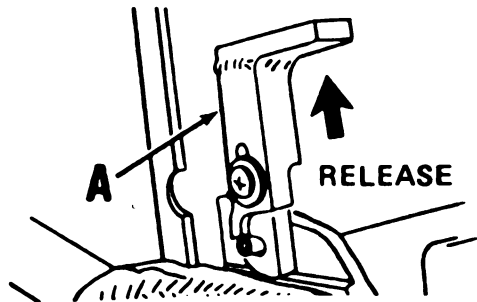
- Check box for secure mounting. Check for tripped or damaged circuit breakers (A).
- Check switch (B) for proper operation. Check connectors (C) for proper installation and security.



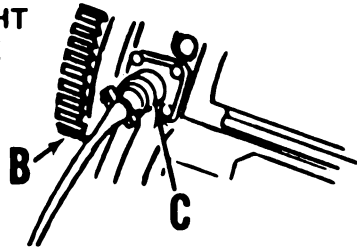
DECLUTCHING FEEDER

Inspection

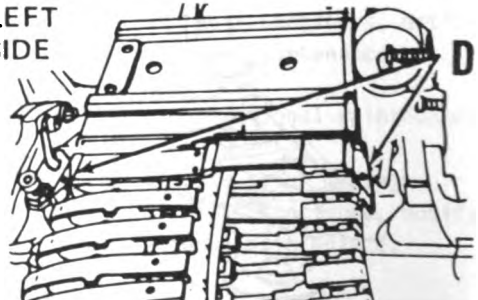
- Remove two front quick release pins and release two rear latches (A) on gun shield. Remove gun shield. Check latches for damage or looseness.
- Check all visible gears (B) for burrs, nicks, or missing teeth.
- Disconnect cable (C) and check plug and receptacle for corrosion, alignment, and cracked inserts.
- Check cable for abraded insulation and reconnect cable.
- Check feed chute clips for serviceability (D).
- Check for broken safety wire on feeder mounting pins.
- Install gun shield.



RIGHT
SIDE



LEFT
SIDE



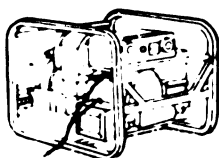
BATTERIES



WARNING



1. **DON'T** handle ammunition when servicing batteries.
2. **DON'T** smoke when servicing batteries.
3. **DON'T** drop any tools across batteries.
4. **DON'T** wear rings, watches, bracelets, or I.D. tags when servicing batteries.



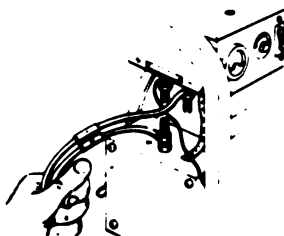
IMPORTANT — Most battery servicing is done by organizational maintenance with crew assistance. Servicing by crew is limited to charging, and inspecting for cleanliness, damage, and that cable connections are secure.

CHARGING BATTERIES
WARNING

Do not operate APU until you are familiar with operating procedures in TM 5-6115-323-14. The APU produces ample electrical power to cause injury if normal safety precautions are not observed.



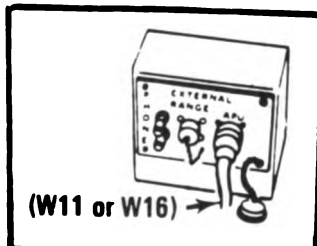
Make sure lead from circuit protector to positive (+) terminal of control box is connected securely. Connect APU power cable W11 or W16 to **LOAD TERMINALS** on APU. Make sure that W11 or W16 cable lead marked negative (-) is connected to the negative terminal on DC control box and that cable lead marked (+) is connected to terminal on circuit protector box.



NOTE

Be sure keys are aligned when installing cable.

Connect other end of power cable to APU receptacle on the service panel. Start APU and adjust controls according to page 2-94.



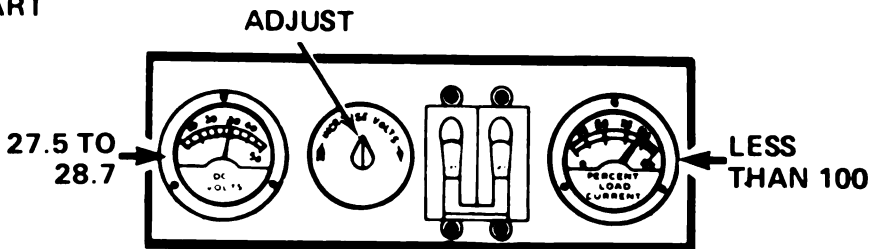
BATTERIES – Continued

CAUTION Do not allow VOLTS meter to exceed 28.7 volts or PERCENT LOAD CURRENT meter to exceed 100 percent when charging batteries or damage may result.

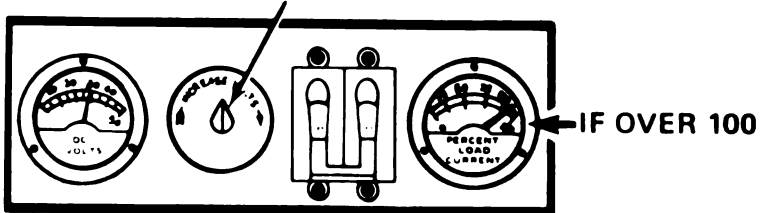
CAUTION If outside temperature is above 80°F, charging voltage should be set at 27.5 V dc. If temperature is below 80°F, charging voltage should be set at 28.7 V dc.

WHEN CHARGING ADJUST APU CONTROL PANEL FOR—

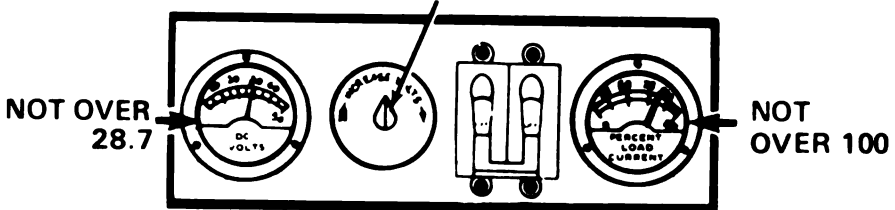
START



ADJUST UNTIL UNDER 100

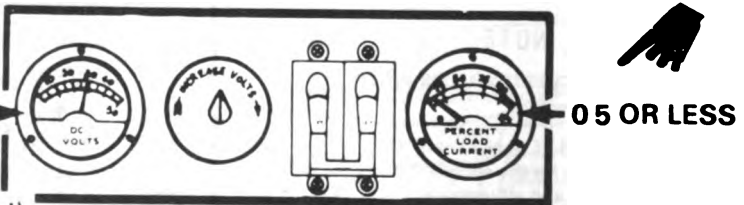


READJUST AS LOAD METER DROPS



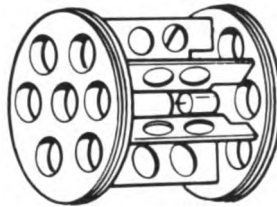
27.5 TO 28.7

FINISHED
(batteries charged)



CAUTION If meter does not show 05 or less after 30 minutes, discontinue charging and notify organizational maintenance.

M168 CANNON

Removal, cleaning, inspection and installation of muzzle clamp assembly, center clamp assembly and barrels.**Removal.****MUZZLE CLAMP**

- Verify that GUN POWER and SYSTEM POWER switches are in their OFF positions.

**WARNING**

Clear cannon. Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE and rotate cannon barrels two complete revolutions.

**CAUTION**

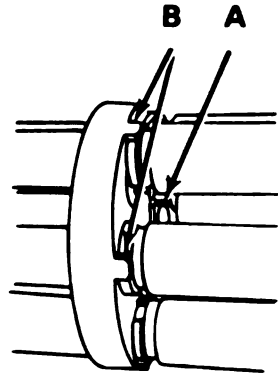
Don't hold switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

CAUTION

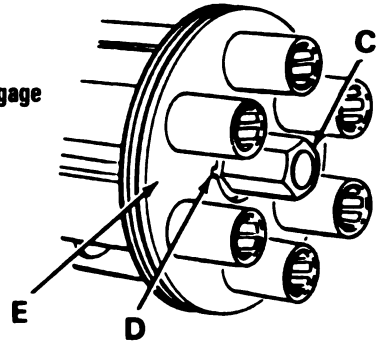
Don't use timing pin to lock barrel cluster while loosening muzzle clamp bolt.

M168 CANNON – Continued

- Place distribution box NORM-STATIC-TEST switch at STATIC position (center), and verify that arming connector is disconnected from firing interrupter.
- Remove cotter pin (A) from center clamp (B) and rotate locking disc in clockwise direction (as seen from muzzle) until it disengages barrels.
- Drive center clamp forward approximately 12 inches.



- Loosen muzzle clamp locking bolt (C) and disengage locating pin or triangular locking plate (D) from hole in front plate.



- Rotate triangular locking plate counterclockwise (as seen from muzzle) until it is free of barrels, and remove muzzle clamp (E).

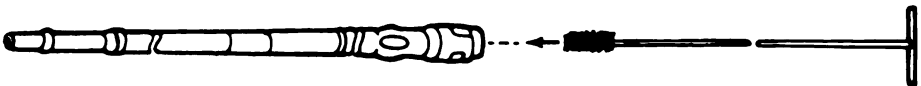
CAUTION

Assure that at no time barrels from one cannon are interchanged with barrels from another cannon.

- Twist each barrel approximately 60 degrees in either direction, and pull out of cannon rotor.

Cleaning.

- Barrels. Clean barrels from breech end. Clean all powder-fouled surfaces using cleaning staff and bore brush saturated with rifle, borecleaner (RBC) (item 26A, appendix D). Wipe dry, coat inside and outside surfaces of cannon barrels with LAW-AW. After application, wipe off excess oil.

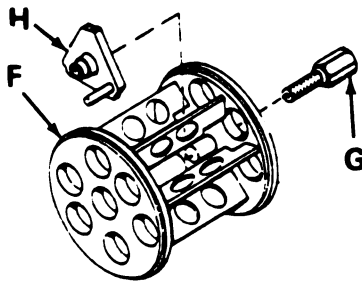


M168 CANNON – Continued

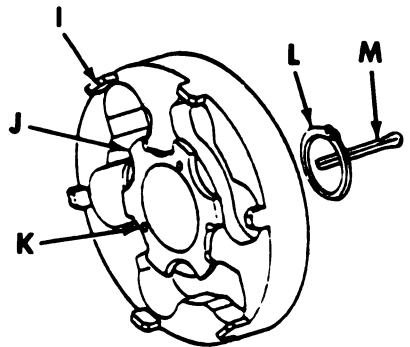
-Muzzle clamp and center barrel clamp. Clean all exposed surfaces with cleaning solvent, SD-2 (item 2, appendix D). Wipe dry all surfaces with LAW-AW. After application, wipe off excess oil.

Inspection.

- Inspection of muzzle clamp assembly. Inspect the muzzle clamp assembly for the presence of any of the following conditions. Notify organizational maintenance if defects are found.
 - Damaged clamp or broken welds (F).
 - Damaged threads on bolt (G).
 - Damaged threads or lugs on locking plate (H).
 - Bent or missing pin on triangular locking plate (H).
 - Defective self-locking feature of triangular locking plate (H).



- Inspection of center clamp assembly. Inspect the center clamp assembly for the presence of any of the following conditions. Notify organizational maintenance if defects are found.
 - Bent or damaged barrel locking lugs on outer plate (I).
 - Defective locking feature of locking disc (J).
 - Missing or damaged spring pin (K).
 - Cracked or damaged locking disc (J).
 - Missing or damaged retaining ring (L).
 - Missing or damaged cotter pin (M).



M168 CANNON – Continued

- Inspection of barrels. Check for cracks and bulges, damaged locking lugs or flanges. Notify organizational maintenance if defects are found.

Installation of barrels, center clamp, and muzzle clamp.

- Set control assembly GUN POWER switch to OFF.

WARNING



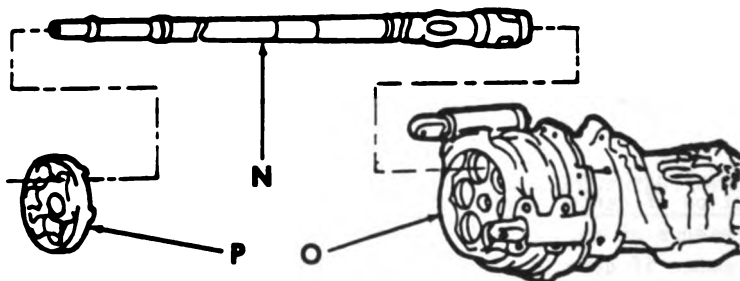
Clear cannon. Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE and rotate cannon barrels two complete revolutions.



CAUTION

Don't hold switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

- Place each barrel (N) in rotor (O) until it hits a positive stop. Twist barrel approximately 60 degrees in either direction.



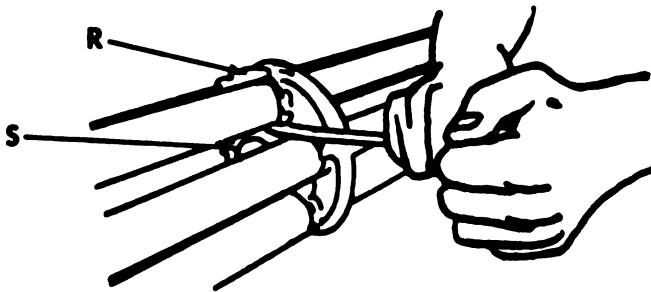
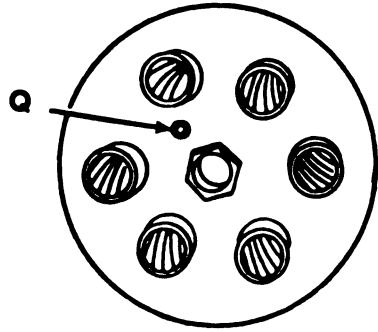
- Position the center clamp (P) on barrels and slide it to within approximately one inch of its normal location on barrels. Twist each barrel to line up slot on barrel with barrel locking lugs on center clamp. Then slide center clamp forward approximately twelve inches, being careful not to change position of barrels.

CAUTION

DO NOT hold BRAKE-CLEAR AND BRAKE switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

M168 CANNON – Continued

- Time cannon. Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE. Depress cannon timing pin and rotate cannon until timing pin engages. Release CLEAR AND BRAKE switch and timing pin. Check that timing pin is disengaged.
- Position muzzle clamp triangular locking plate so that pin is slightly to right of locating hole (Q) in muzzle clamp.
- Place muzzle clamp on barrels so that the NO. 1 barrel is in the four o'clock position (in line with firing contact) as viewed from the muzzle.
- Slide muzzle clamp rearward until it hits a positive stop. Care should be taken so that position of barrels is not changed.
- Rotate muzzle clamp triangular locking plate clockwise until pin on locking plate is aligned with locating hole in front plate of muzzle clamp. Ensure that triangular locking plate engages rear sides of barrel flanges.
- Slide center clamp (R) in position, turn locking disc (S) counterclockwise (as viewed from the muzzle) until it reaches the locked position (holes in locking disc and clamp body aligned). Install cotter pin.



CAUTION

Do not use any auxiliary means of retaining cannon to reach torque requirement. Tighten against the gun drive motor brakes only.

- Torque muzzle clamp bolt to 600-650 in-lb.

M168 CANNON – Continued

Breech bolt removal.

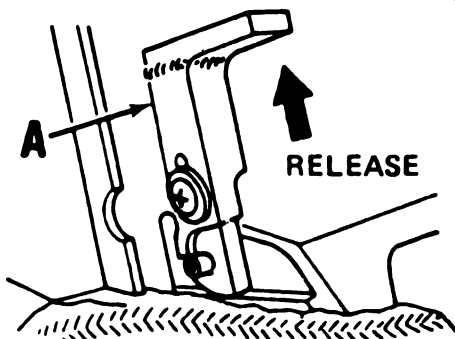


WARNING

Make sure the cannon is clear and **SYSTEM POWER** and **GUN POWER** switches are **OFF** before performing the following procedure.

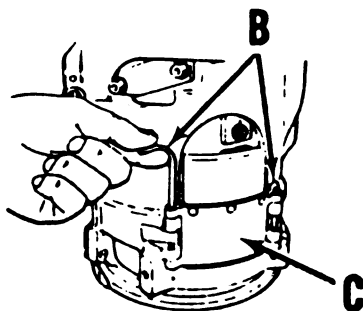


- Remove two front quick release pins and release two rear latches (A) on gun shield. Remove gun shield, then manually elevate cannon to maximum elevation.



- Set elevation drive brake to **ON**.

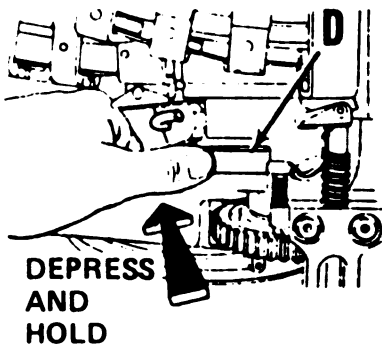
- Pull two bolt access cover pins (B) and remove bolt access cover (C).



CAUTION

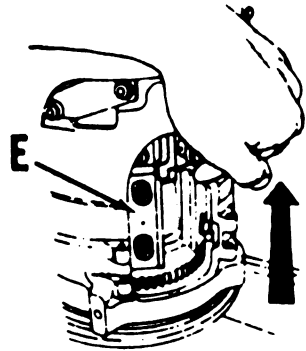
Don't hold **BRAKE-CLEAR** AND **BRAKE** switch in **CLEAR** AND **BRAKE** position longer than 10 seconds during any 1 minute interval.

- Have a second man depress and hold clearing cam sector (D) on cannon, and set **BRAKE-CLEAR** AND **BRAKE** switch to **CLEAR** AND **BRAKE** on your command.

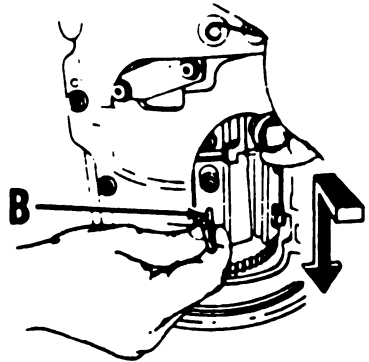


M168 CANNON – Continued

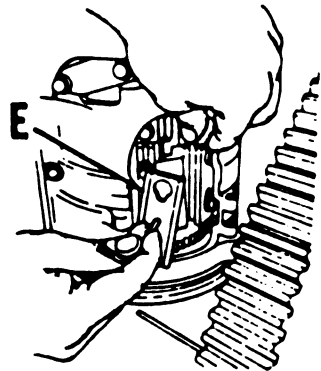
- Rotate cannon until bolt is in access cover area, and release BRAKE-CLEAR AND BRAKE switch. Then move bolt forward to clear removable track (E).



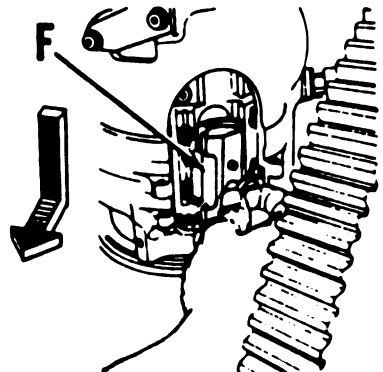
- Use bolt access cover pin (B) to depress track lock pin and release removable track.



- Move track (E) to rear and out.

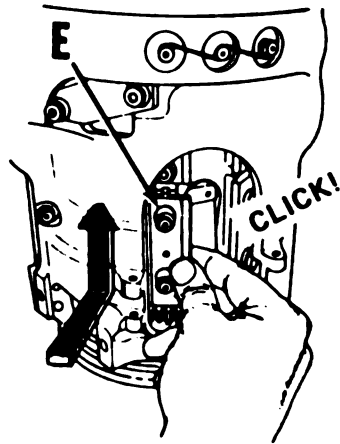


- Slide bolt (F) to rear and lift out.



M168 CANNON – Continued

- Wipe clean and replace removeable track (E) with large diameter hole toward muzzle of cannon, and slide track forward until locking pin snaps into place.
- Remove five remaining bolts in the same manner replacing each track.



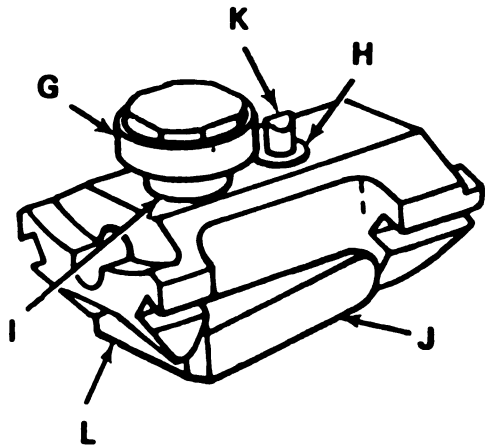
Cleaning.

- Clean rotor tracks and breech bolt assemblies and lubricate according to LO 9-1005-318-13.

Inspection.

Breech bolts

- Check roller (G) on bolt shaft for free movement, flats and gouges.
- Check visible portion of firing pin cam insulation (H) for cracks.
- Check bolt shaft (I) for grooves, nicks, burrs, and cracks.
- Check bolt shaft, locking block (J), and firing pin cam (K) for freedom of movement.
- Check locking surface (L) for scoring or damages.
- Check for proper lubrication (LO 9-1005-318-13).



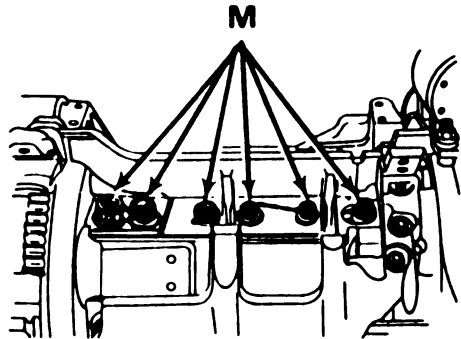
Rotor

CAUTION

Don't hold BRAKE-CLEAR AND BRAKE switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

M168 CANNON – Continued

- Remove case and link chutes.
- Hold switch in CLEAR AND BRAKE position.
- Rotate cannon in firing direction and check that safety wiring on track bolts and screws (M) is undamaged.
- After check, install case and link chutes. Make sure link chute is connected properly to feeder.



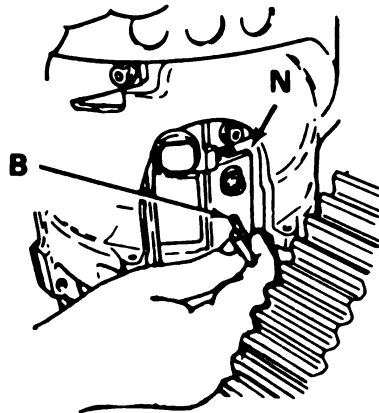
NOTE: Feeder removed for clarity.

Installation.

CAUTION

Don't hold BRAKE-CLEAR AND BRAKE switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

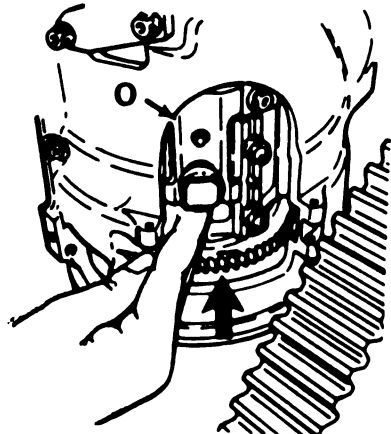
- Set switch to CLEAR AND BRAKE and rotate cannon until a right side track (N) appears in the cover area. Release switch. Use bolt access cover pin (B) to depress track lock pin and release track.



CAUTION

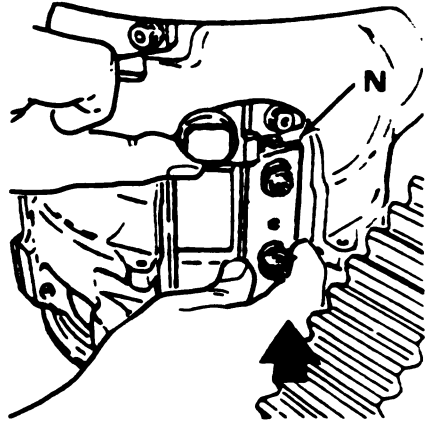
Insure that rotor track is free of any other bolts.

- Install bolt (O) on track and move bolt forward.



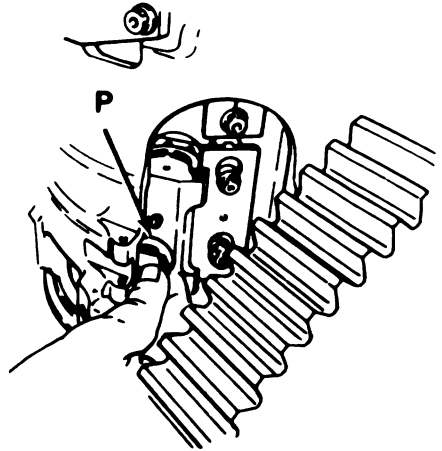
M168 CANNON – Continued

- Reinstall removeable track (N).



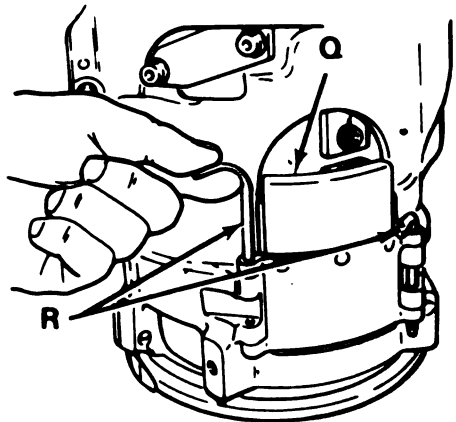
NOTE: Have an assistant set BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE position on your command.

- Push in on bolt roller shaft (P). Set switch to CLEAR AND BRAKE position, ensure roller is aligned with cam path, and rotate it in position to install next bolt. Release switch. Remove right track.

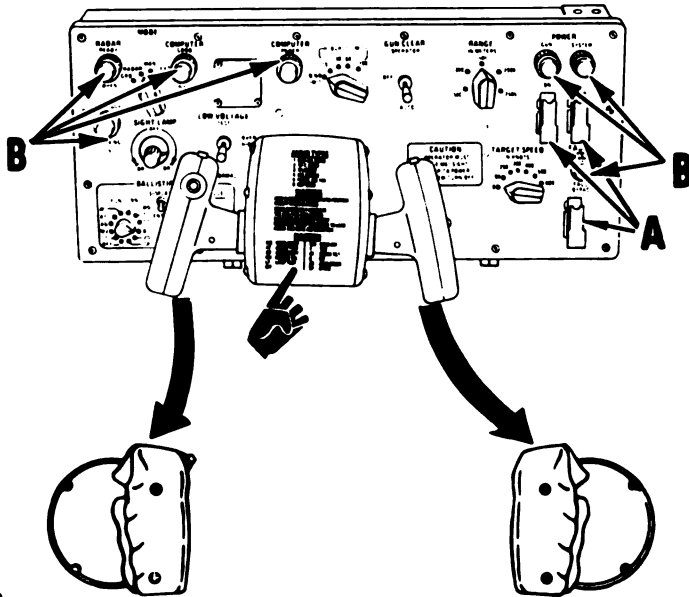


- Install remaining bolts in the same manner.

- Install bolt access cover (Q) and secure with pins (R).
- Set BRAKE- CLEAR AND BRAKE switch to CLEAR AND BRAKE position.
- Manually rotate cannon one revolution.
- Lower cannon and install gun shield.



CONTROL ASSEMBLY

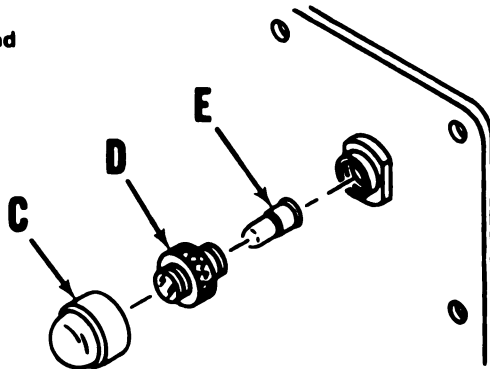
**Inspection.**

- Check all switches for free movement and smoothness of operation.
- Check for chipped or flaking paint.
- Check markings for legibility.
- Check that guards (A) pivot smoothly over switches.

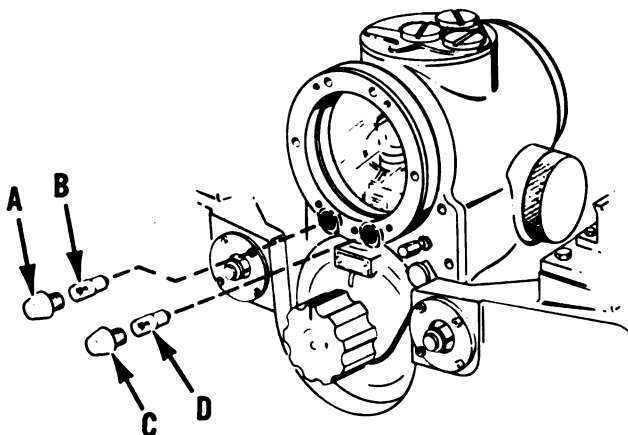
Cleaning. Dry cleaning solvent (SD-2, item 2, appendix D) may be used to clean grease and oil from unpainted metal parts.

Lamp (B) replacement.

Unscrew cover (C), lens (D) and replace lamp (E).



M61A1 SIGHT AND AZIMUTH INDICATOR



LAMP REPLACEMENT

TRACK/JAM/RADIATE lamp - Unscrew yellow lens cover (A), remove lamp (B), and replace.

READY-TO-FIRE lamp - Unscrew clear lens cover (C), remove lamp (D), and replace.

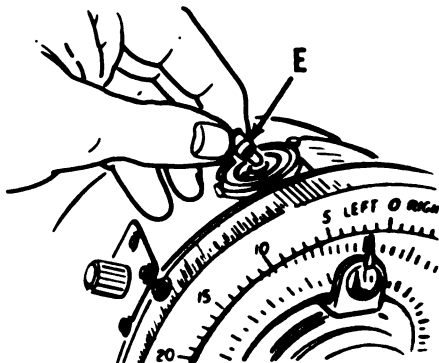
Azimuth indicator lamps - Unscrew lamp (E), and replace.

CAUTION

When cleaning the sight, take care not to scratch lens.

CLEANING

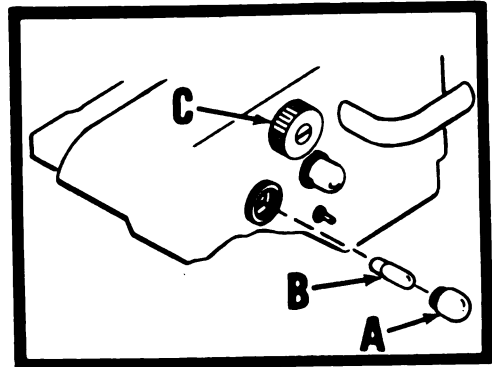
All glass surfaces on the sight should be cleaned with cheesecloth (item 4, appendix D). Dry cleaning solvent (item 2, appendix D) may be used to clean grease and oil from unpainted metal parts.



RECEIVER-TRANSMITTER AND RF POWER LAMPS

LAMP REPLACEMENT

Receiver-transmitter front panel lamps, two. Unscrew lens cover (A) and replace lamp (B).



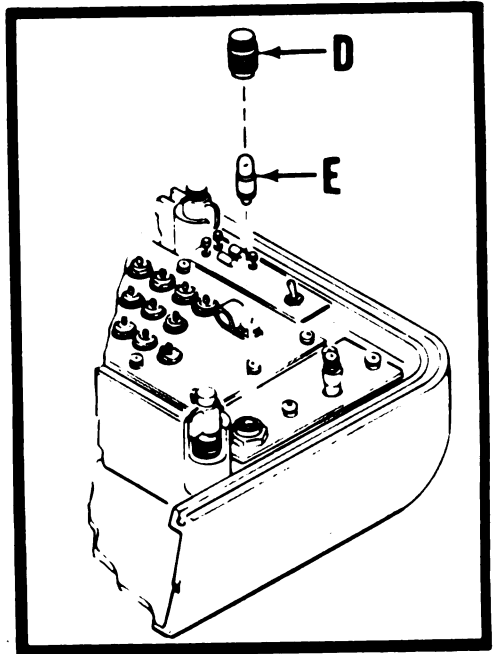
Receiver-transmitter power lamp (inside).



WARNING

High voltage is present in receiver-transmitter when radar is energized to radiate. Death on contact may result if personnel fail to observe safety precautions.

- Set control assembly SYSTEM POWER switch to OFF.
- Remove cable guard.
- Open front panel by turning four thumbscrews (C) counterclockwise.
- Unscrew lens (D) and replace Lamp (E).
- Close front panel and secure with thumbscrews.
- Replace cable guard.



RECEIVER-TRANSMITTER AIR FILTER

Removal and Cleaning.

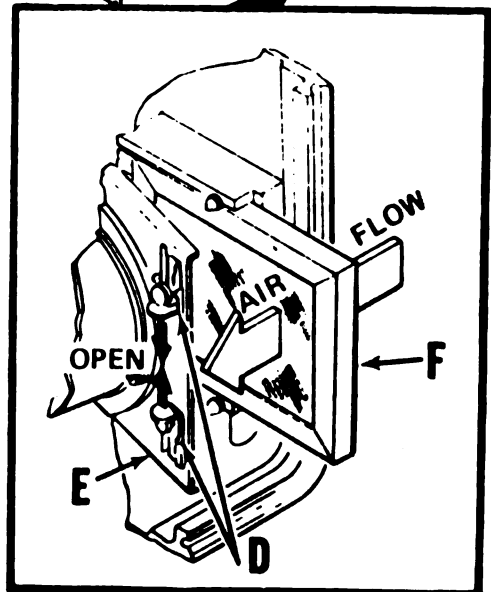
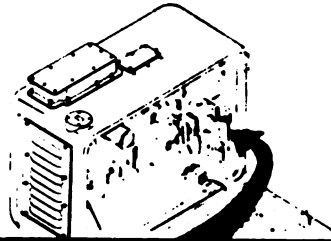
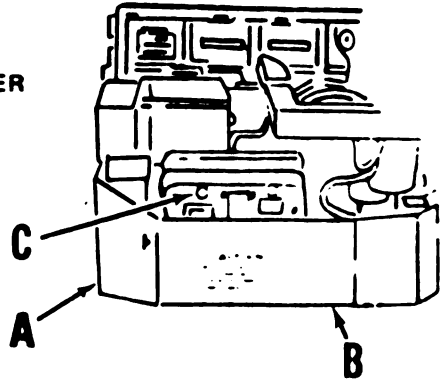


WARNING



High voltage is present in receiver-transmitter when radar is energized to radiate. Death on contact may result if personnel fail to observe safety precautions.

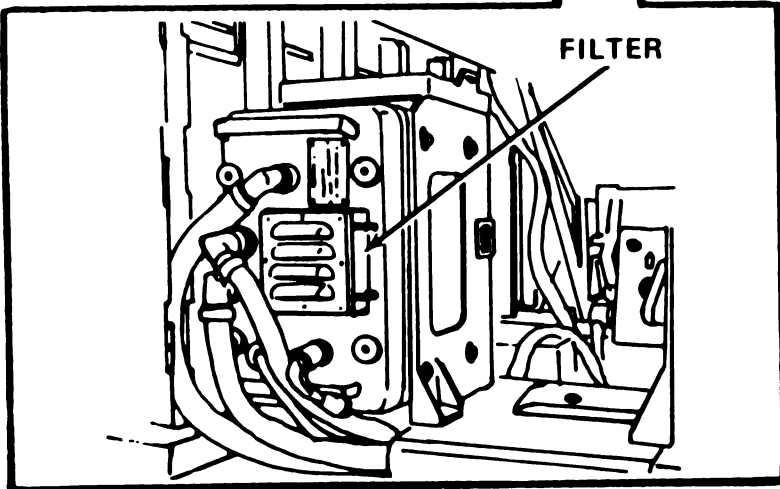
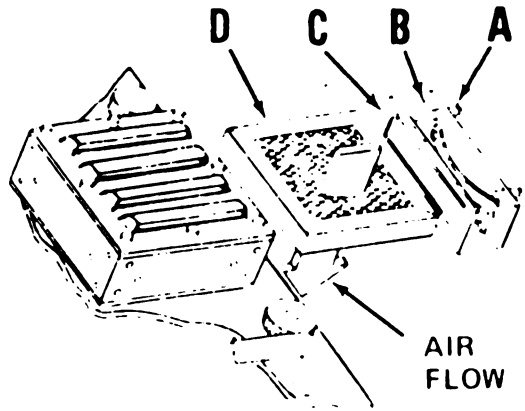
- Set control assembly **SYSTEM POWER** switch to **OFF**.
- To gain access to receiver-transmitter, unlock quick release fasteners, thumb-screws under baseplate, and quick release pins; then slide both cable guards **A** and **B** off.
- Open front panel by turning four thumbscrews (**C**) counterclockwise.
- Open scissor clips (**D**) and cover (**E**).
- Remove filter (**F**).
- Wash air filter in clear water or a solution of water and mild detergent. Hold filter vertically and dip in water to clean. Rinse thoroughly and dry completely before reinstalling.
- Install air filter, observing airflow arrow direction on filter frame.
- Close cover and engage upper and lower scissor clips.
- Close front panel and secure with thumbscrews.
- Install cable guards **A** and **B**.



POWER SUPPLY AIR FILTER

Removal and Cleaning

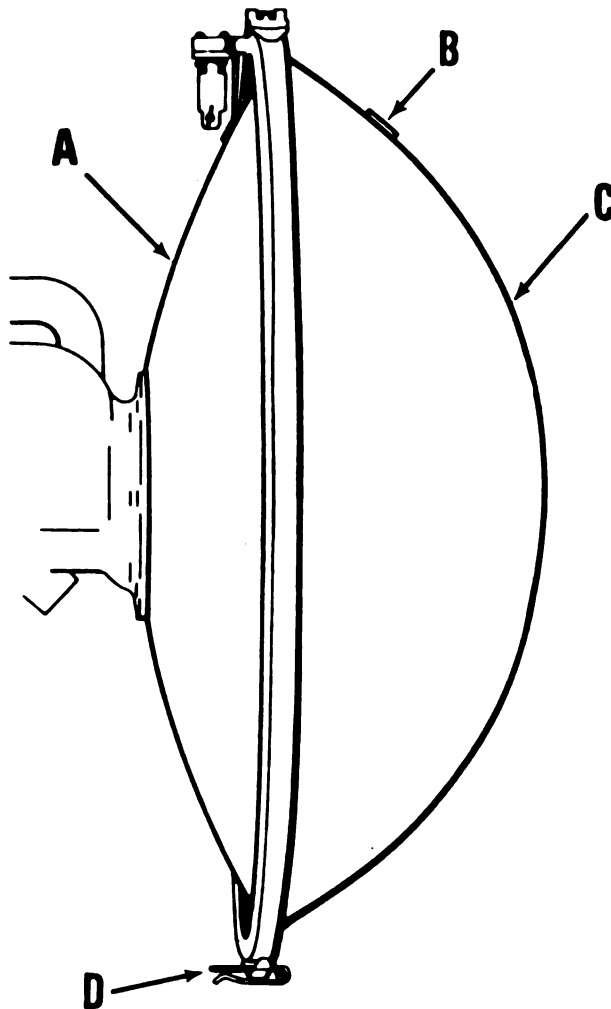
- Loosen thumbscrews, remove quick release pin, and remove cable guard.
- Turn four captive screws (A) counterclockwise to remove access plate (B) and gasket (C).
- Remove filter (D) by pushing filter gently, using a screwdriver through louvers.
- Wash air filter in clear water or a solution of water and mild detergent. Hold filter vertically and dip in water to clean. Rinse thoroughly and dry completely before installing.
- Install air filter (D), observing air flow arrow direction on filter frame.
- Install gasket (C), access plate (B) and secure with four captive screws (A).
- Install cable guard.



ANTENNA REFLECTOR AND FEED ASSEMBLY

Inspection. (Notify organizational maintenance if defect is found during inspection.)

- Check reflector (A) for dents, bends, or holes. Check for distortion of reflector parabolic shape.
- Check that caplug (B) is installed.
- Check radome (C) for dents, bends, or holes.
- Check that radome (C) is attached securely to reflector and that draw latch handle is secured with pin (D).



CHAPTER 4

MAINTENANCE OF AUXILIARY EQUIPMENT

4-1 Introduction. This chapter contains maintenance procedures for the gun system's auxiliary equipment.

4-2 Procedures. When performing maintenance, record any maintenance action according to DA PAM 738-750. Notify organizational maintenance of any malfunctions beyond your scope to correct. For maintenance of the following equipment, refer to the following applicable TM:

AUXILIARY POWER UNIT	TM 5-6115-323-14
GUNNER'S QUADRANT	TM 9-1290-200-14&P
NIGHT VISION SIGHTS	TM 11-5855-202-13 or TM 11-5855-214-10
TARGET ALERT DATA DISPLAY SET (TADDS)	TM 9-1430-589-12

H-251/U HEADSET - Check for proper operation and any damage that may cause failure of the headset.

TA-312/PT TELEPHONE SET - Check for proper operation and any damage that may cause failure of the telephone set.

BORESIGHT KIT - Check M109 telescope and mandrel for any damage that may affect accuracy.

CHAPTER 5

AMMUNITION

SECTION I . GENERAL

5-1 General. This chapter contains a description of 20MM ammunition intended for use with the cannon. National stock numbers and pertinent data for the standard ammunition are listed in SC-1305/30 IL.



WARNING



Rechambering of live ammunition is prohibited. The use of previously chambered cartridges may result in damage to equipment or injury to personnel due to cartridge hangfire. Propellant-primer contamination, a cause of hangfire, can occur because the chambering action may loosen the projectile in the cartridge case and break the waterproof seal. Any cartridges that have been chambered and later extracted unfired will be disposed of in accordance with TM 9-1 300-206 and/or local regulations.

5-2 Description and Identification. The ammunition is painted and color coded to provide a ready means of identification. Caliber, type, model, and lot number are marked on the projectiles. The following table shows the types and color codes. The ammunition types are further described following the table.

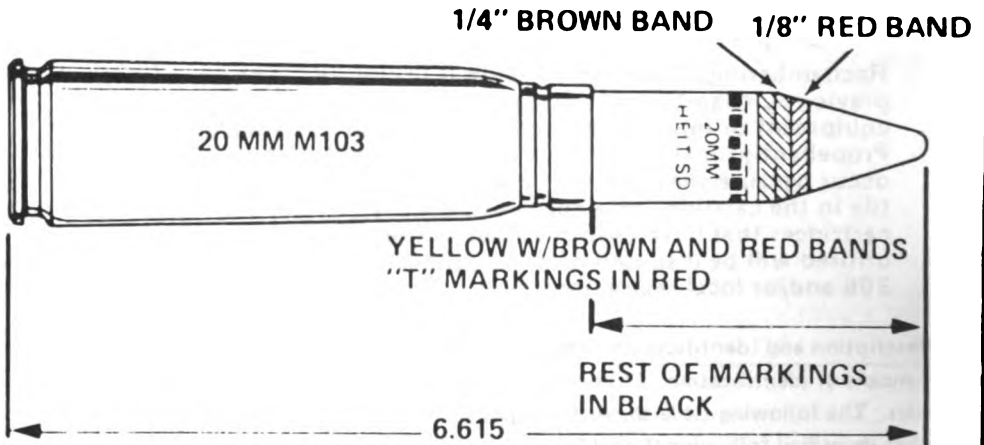
Table 5-1. Types and Color Codes of Ammunition

Key Fig.	Kind of ammunition	Color of projectile	Color of marking
1	HEIT-SD M246/M246A1 (high-explosive incendiary tracer-self destruct)	Yellow w/brown and red bands	"T" in red, rest of markings black
2	HEI, M56A3/M56A4 (high-explosive incendiary)	Yellow w/red band	Black
3	TP-T, M220 (target practice-tracer)	Blue	"T" in orange, rest of markings in white
4	TP, M55A2 (target practice)	Blue	White
5	Dummy, M51A2	Chromate	Metal Stamping
6	PATEC		

AMMUNITION – Continued
DESCRIPTION AND IDENTIFICATION

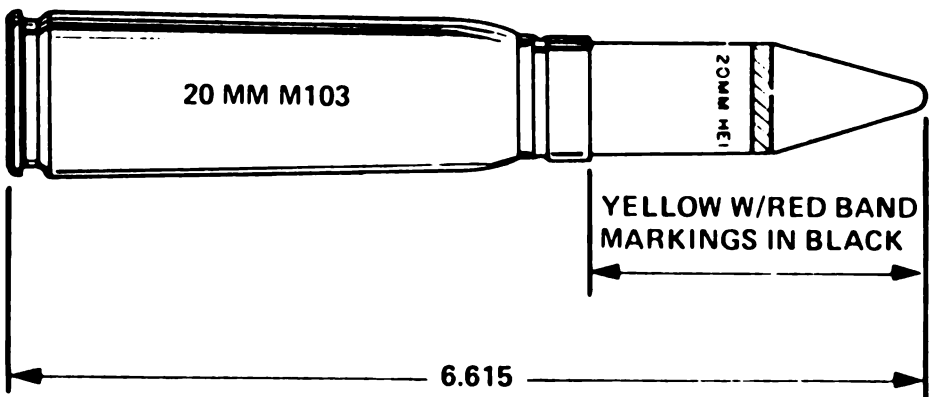
1

High Explosive Incendiary With Tracer Self-destroying (HEIT-SD), M246/M246A1. This cartridge is assembled with an M505A3 point detonating (PD) fuze. The projectile, in addition to the M505A3 fuze, consists of an HEI charge, self-destruct relay charge, and a tracer charge. These charges form the self-destruct chain. The tracer burns for about 3 to 7 seconds, whereupon the relay charge is ignited which detonates the HEI charge low order. If impact with a target occurs, prior to self-destruction, the M505A3 fuze causes the HEI charge to detonate high order. This cartridge is for use against aerial targets. The basic difference between the models is in the loading of the projectiles. In the M246 projectile, the Incendiary and the HE mix are combined in one pellet. In the M246A1 projectile, the Incendiary is loaded as a separate pellet and the HE mix is also loaded as a separate pellet along with the self-destruct relay pellet and the tracer charge pellet.



2

High Explosive Incendiary (HEI), M56A3/M56A4. This cartridge is for use against ground targets, including lightly armored vehicles, functioning with both explosive and incendiary effect. The projectile consists of an HEI charge and is assembled with the M505A3 fuze. The M505A3 fuze is a point-detonating, single-action fuze intended to function on impact with the target. The models differ in the method of loading the projectile. The M56A3 has the HE mix and the Incendiary mix combined in one pellet. The M56A4 has the Incendiary pellet inserted into the projectile, and then the HE mix pellet is added.

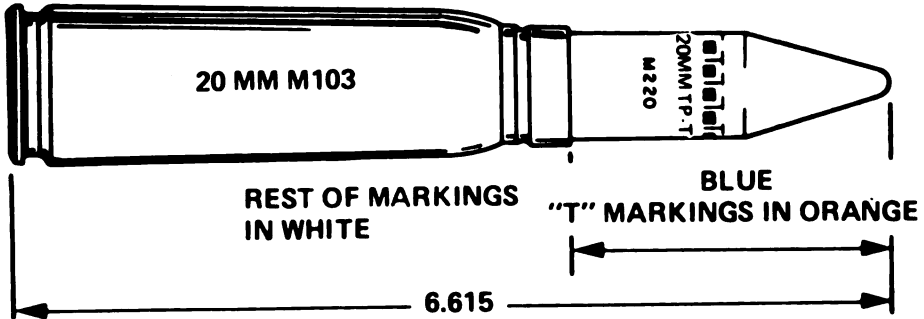


AMMUNITION – Continued

DESCRIPTION AND IDENTIFICATION—CONTINUED

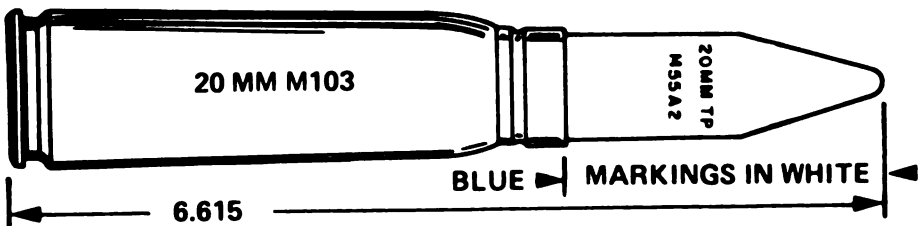
3

Target Practice - Tracer (TP-T), M220. This cartridge is for practice and training. The projectile is similar to the M56A3 projectile, but has no HEI charge and is assembled with a dummy fuze. The projectile does contain a tracer composition which burns visibly for a minimum of 1.9 seconds.



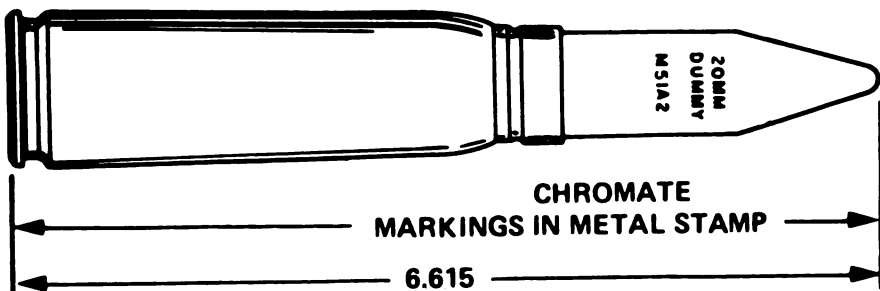
4

Target Practice (TP), M55A2. This cartridge is for practice and test firings. The projectile is similar to the M56A3 projectile, but is hollow and contains no HEI charge or tracer.

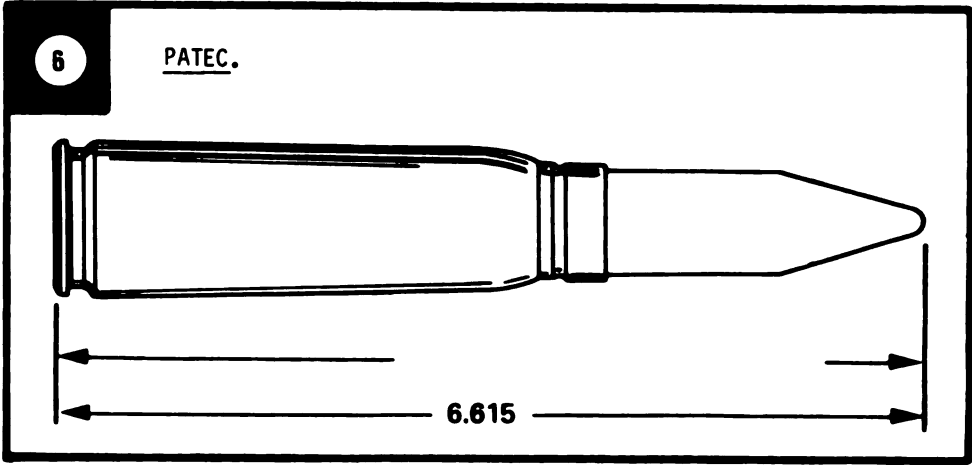


5

Dummy, M51A2. The dummy is a completely inert assembly used for nonfiring system checkout.



DESCRIPTION AND IDENTIFICATION – CONTINUED



AMMUNITION – Continued

SECTION II . PREPARATION FOR FIRING

Ammunition will be visually inspected to assure that it is clean, free of grease and corrosion, and that it is free of perforations, cracks and splits, severe scratches, cuts and dents other than those caused by normal delinking and relinking operation.

SECTION III . CARE, HANDLING, AND PRESERVATION

Explosive ammunition must be handled with appropriate care at all times. Explosive elements such as primers and fuzes are sensitive to excessive shock, electrical discharge, and temperature. Keep ammunition in a serviceable condition and ready for immediate use as follows:

- (1) Store ammunition in original containers in a dry, well-ventilated place protected from rays of sun and other sources of excessive heat.
- (2) Keep ammunition and its container clean and dry and protected from possible damage.
- (3) Disassembly of components of ammunition, such as fuzes and primers, is strictly prohibited. Any alteration of ammunition is hazardous and shall not be undertaken. Relinking of ammunition is permitted.
- (4) Do not open sealed ammunition containers or remove protective or safety devices until just before use.
- (5) Return ammunition, prepared for firing but not fired, to its original packing and mark it appropriately. Use such ammunition first in subsequent firings in order to keep stocks of opened packages at a minimum.

APPENDIX A REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual.

A-2. FORMS

Expandable/Durable Items (except Medical Class V, Repair parts and heraldic items). . . . .	.CTA50 970
Recommended Charges to Equipment Technical Publications . . . . .	.DA 2028-2
Equipment and Inspection and Maintenance Worksheet. . . . .	.DA 2404
Maintenance Request . . . . .	.DA 2407
Weapon Record Data. . . . .	.DA 2408-4
Quality Deficiency Report. . . . .	.SF 368

A-3. FIELD MANUALS

First Aid For Soldiers . . . . .	.FM 21-11
Operations and Training, Forward Area Alerting Radar (FAAR) and Target Alert Data Display Set (TADDs). . . . .	.FM 44-6

A-4. TECHNICAL MANUALS

Operator/Crew, Organization, Intermediate (Field) (Direct Support and General Support) and Depot Maintenance Manual; Generator Set, Gasoline Engine Driven, Skid Mounted, Tubular Frame, 1.5kW Single Phase, AC, 120/240V, 28V, DC (Less Engine) (DOD Models MEP-015A), 60Hz (NSN 6115-00-889-1446) and (Model MET-025A) DC, 60Hz (NSN 6115-00-017-8236) (20 35C2-3-385-1). . . . .	.TM 5-6115-323-14
Organizational Maintenance Manual for Gun, Air Defense Artillery, Self-Propelled: 20-MM, M167A2, Cannon M168, Mount M142, Sight M61A1 and Radar AN/VPS-2A (NSN 1005-01-177-9237) . . . . .	.TM 9-1005-318-20-1

REFERENCES - Continued

- Operator's, Organizational, Direct Support, and
General support Maintenance Manual Including
Repair Parts and Special Tools List (Includes
Depot Maintenance Repair Parts and Special Tools)
for Quadrant, Fire Control (Gunner's) M1A1 W/E
(NSN 1290-00-891-9999) and M1A2 (Radioactive) W/E
(NSN 1290-00-169-1937)TM 9-1290-200-14&P
- Ammunition, General.TM 9-1300-200
- Ammunition and Explosives Standards.TM 9-1300-206
- Operator's Manual for Maintenance Manual:
Target Alert Data Display Set AN/GSQ-137
(XO-2) (Forward Area Alerting Radar System)TM 9-1430-589-12
- Operator's Manual, Truck, Cargo, 1-1/4 Ton,
6 X 6 (Gamma Goat) M561.TM 9-2320-242-10
- Operator's Organizational, and Direct Support
Maintenance Manual, Night Vision Sight, Crew
Served Weapon, AN/TVS-2 (NSN 5855-00-087-3144),
AN/TVS-2A (NSN 5855-00-791-3358) and AN/TVS-2B
(NSN 5855-00-484-8638).TM 11-5855-202-13
- Operator's Manual for Night Vision Sight,
Crew Served Weapon, AN/TVS-5
(NSN 5855-00-629-5327).TM 11-5855-214-10
- Operator's, Organizational, and Direct Support
Maintenance Manual, Night Vision Sight, Crew
Served Weapon, AN/TVS-2 (NSN 5855-00-087-3144),
AN/TVS-2A (NSN 5855-00-087-3144), AN/TVS-2A
(NSN 5855-00-791-3358) and AN/TVS-2B
(NSN 5855-00-484-8638).TM 11-5855-202-13
- Operator's Manual for Night Vision Sight, Crew
Served Weapon, AN/TVS-5 (NSN 5855-00-629-5327).TM 11-5855-214-10
- Operator's, Organizational, Direct Support, and
General Support Maintenance Manual Suppressor,
Electrical Transient MX-7778A/GRC
(NSN 5915-00-413-6718).TM 11-5915-224-14

REFERENCES - Continued

A-5. MISCELLANEOUS

The Army Maintenance Management System (TAMMS)	DA PAM 738-750
Lubrication Order.	LO 9-1005-318-13
FSC 1305 - Ammunition thru 30-MM; FSC 1310 - Ammunition, over 30-MM up to 75-MM; FSC 1315 - Ammunition 75-MM thru 125-MM; FSC 1320 - Ammunition over 125-MM; FSC 1325-Bombs and FSC 1330 - Grenades	SC 1305/30-IL
Color, Marking and Camouflage Painting of Military Vehicles, Construction Equipment, and Material Handling Equipment	TB 43-0209

APPENDIX B

COMPONENTS OF END ITEM LIST AND BASIC ISSUE ITEMS LIST

SECTION I . INTRODUCTION

B-1. Scope. This appendix lists components of end item and basic issue items for the M167A2 towed air defense gun to help you inventory items required for safe and efficient operation.

B-2. General. The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. **Section II. Components of End Item.** This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. **Section III. Basic Issue Items.** These are the minimum essential items required to place the M167A2 towed air defense gun in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the M167A2 towed air defense gun during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-3. Explanation of Columns. The following provides an explanation of columns found in the tabular listings:

a. **Column (1) - Illustration Number (Illus Number).** This column indicates the number of the illustration in which the item is shown.

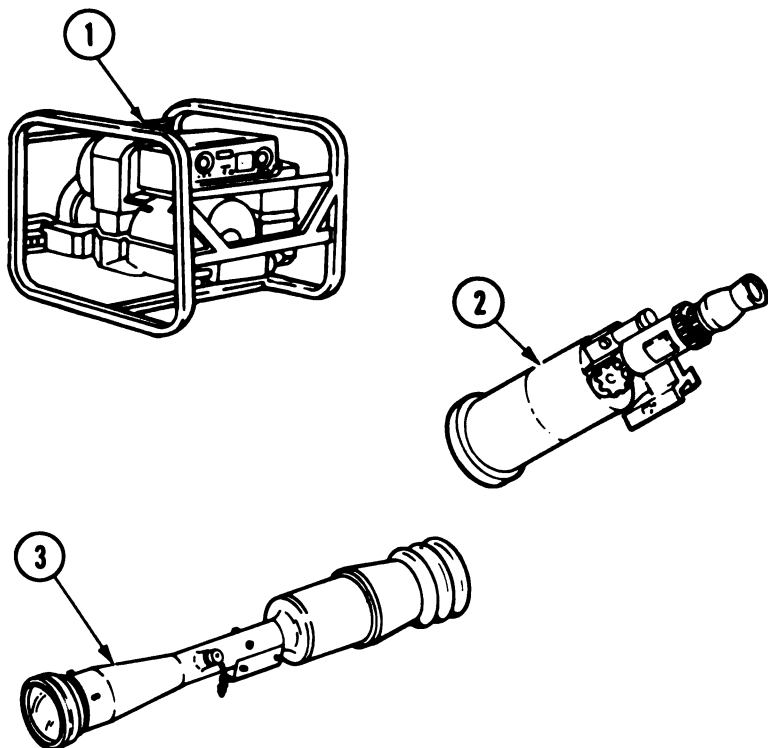
b. **Column (2) - National Stock Number.** Indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

c. **Column (3) - Description.** Indicates the National item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. **Column (4) - Unit of Measure (U/M).** Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. **Column (5) - Quantity required (Qty rqr).** Indicates the quantity of the item authorized to be used with/on the equipment.

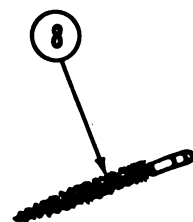
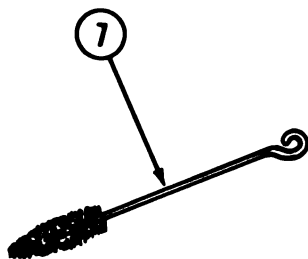
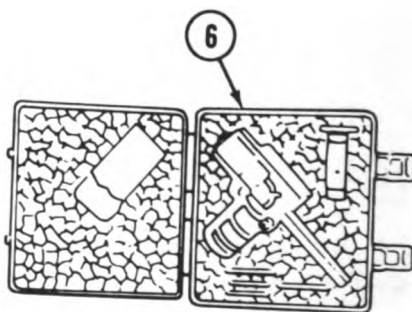
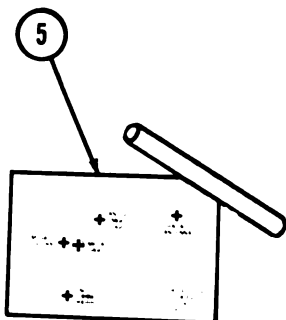
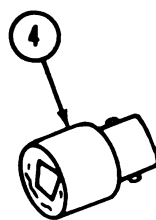
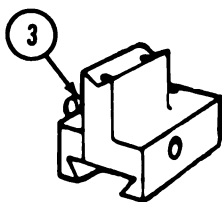
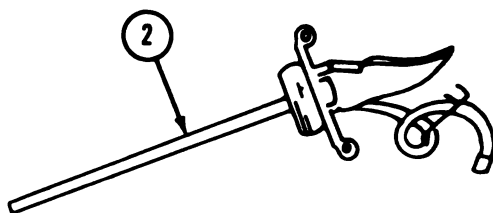
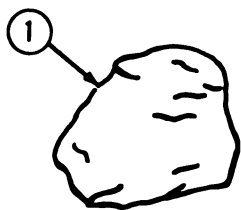
SECTION II . COMPONENTS OF END ITEM



COMPONENTS OF END ITEM (COEI) - Continued

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number Usable On Code	(4) U/M	(5) Qty rqr
1	6115-00-017-8236	GENERATOR SET: 1.5 kw (97403) 13213E2700 G41	EA	1
2	5855-00-629-5327	NIGHT VISION SIGHT, AN/TVS-5 (80063) SMD850100-1 G41	EA	1
3	1240-00-179-1155	TELESCOPE, STRAIGHT: M134 (19200) 11728190 G41	EA	1

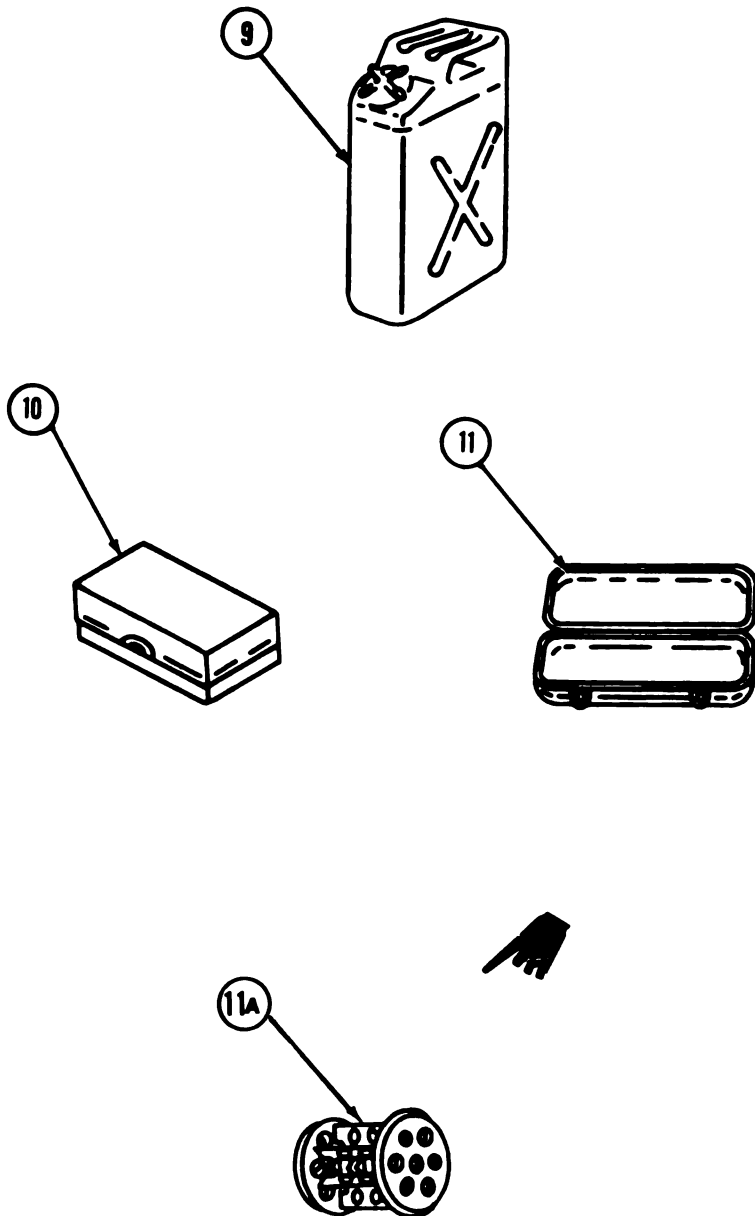
Section III. BASIC ISSUE ITEMS



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
(a) FIG NO	(b) ITEM NO				
B-1	1	1005-00-135-4542	COVER, ANTENNA (19204) 8438339	EA	1
B-1	2	2910-00-066-1235	ADAPTER, CONTAINER (06076) 13211E7541	EA	1
B-1	3	1005-01-138-3874	ADAPTER, MOUNTING (AN/TVS-5) (19200) 12011766	EA	1
B-1	4	5120-00-240-8703	ADAPTER, SOCKET WRENCH: 3/8 in. sq female, 1/2 in. sq male (81348) GGG-W-641	EA	1
B-1	5	6625-01-277-5739	BORESIGHTING KIT, TARGET (19200) 9361372	EA	1
B-1	6	4931-00-997-4568	BORESIGHT KIT ASSEMBLY (19200) 10545540	EA	1
B-1	7	1005-00-722-5087	BRUSH, CLEANING, SMALL ARMS (19205) 7225087	EA	1
B-1	8	1005-00-610-8828	BRUSH, CLEANING, SMALL ARMS (19206) 6108828	EA	1

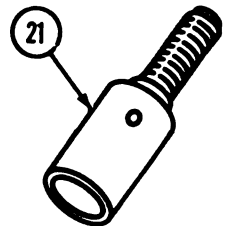
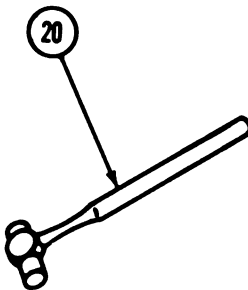
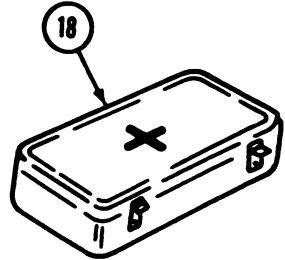
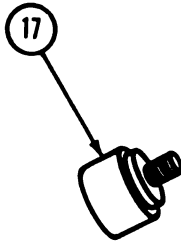
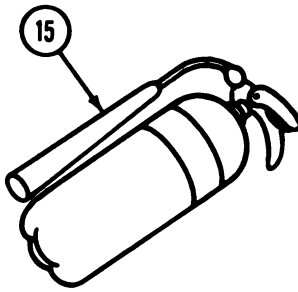
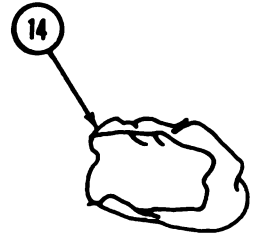
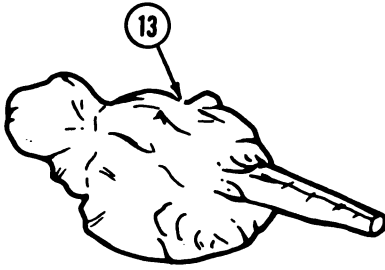
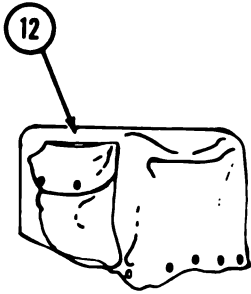
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
FIG NO	ITEM NO				
B-1	34	5120-00-010-7915	SCREWDRIVER, FLAT TIP 1/4 in. Tip 5 3/4 in. lg. (81348) GGG-S-121	EA	1
		5120-00-596-8502	SCREWDRIVER, FLAT TIP (81348) GGG-S-121	EA	1
		5120-00-278-1276	SCREWDRIVER, FLAT TIP (96906) MS15432-4	EA	1
B-1	34A	5120-00-221-7079	SCREWDRIVER, RACHET (81348) GGG-S-121	EA	1
B-1	35	1005-00-709-7668	SECTION ASSEMBLY, BRUSH (19205) 8766014	EA	3
B-1	36	1015-00-790-3611	SECTION END, CLEANING (19206) 8766088	EA	1
B-1	37	5120-00-189-7935	SOCKET, SOCKET WRENCH (1/2 sq. in. drive, 12 pt, 15/16 in. opng) (81348) GGG-W-641	EA	1
B-1	38	7240-00-177-6154	SPOUT, CAN, FLEXIBLE CAM TYPE 16 LG, 2-1/4 in. OD CAM, 1.238 in. OD TUBE (81349) MIL-S-1285	EA	1
B-1	39	1010-00-832-9153	STAFF, CLEANING (19204) 11687054	EA	1

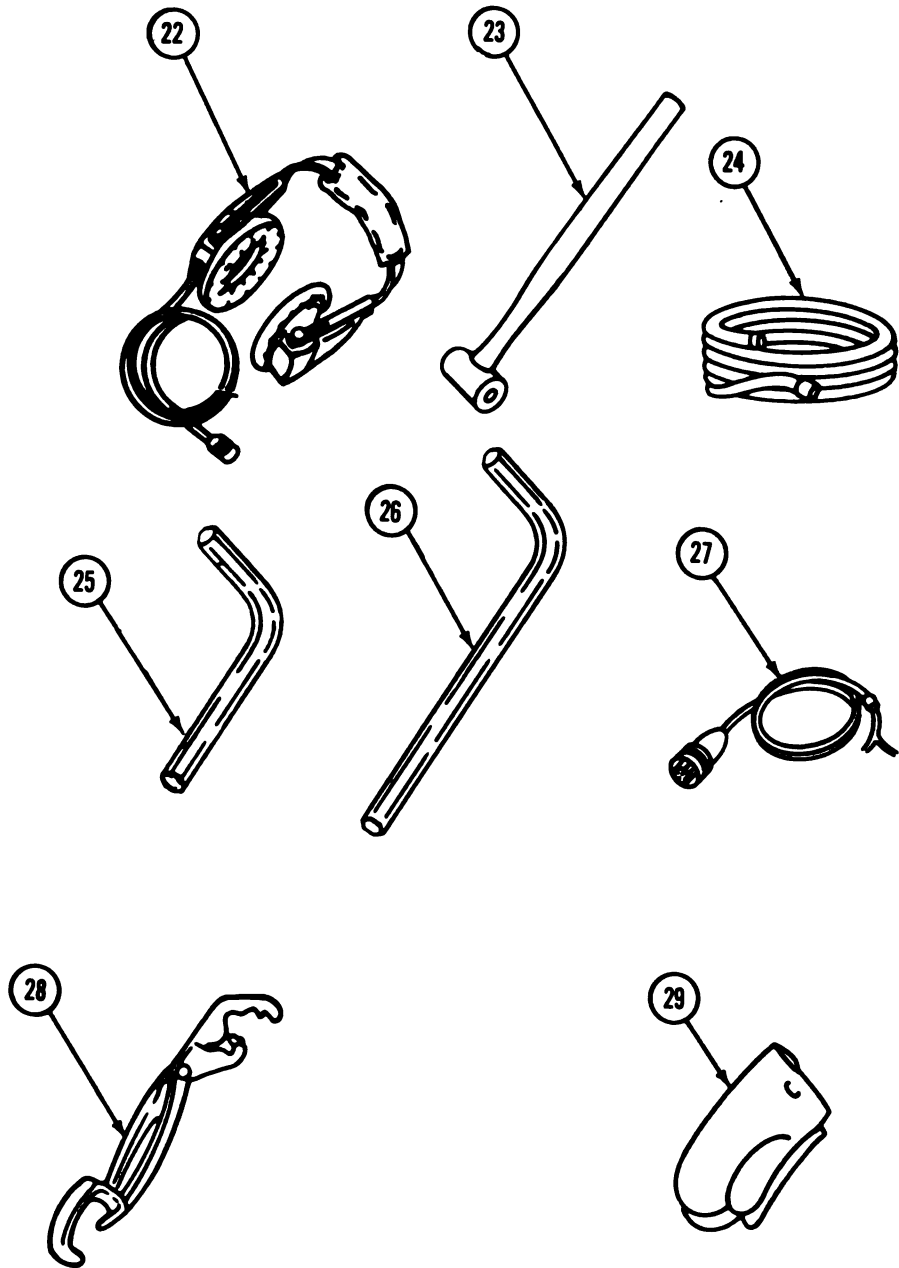
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1)		(2)	(3)	(4)
ILLUSTRATION		National Stock Number	Description FSCM and Part number	U / M
FIG NO	ITEM NO			
B-1	12	6115-00-941-1655	COVER, GENERATOR SET (97403) 13214E0156	EA
B-1	13	1005-01-150-5869	COVER, GUN MOUNT (19200) 9352711	EA
B-1	14	1015-00-678-9666	COVER, GUN MUZZLE (19206) 8766037	EA
B-1	15	4210-00-202-7858	EXTINGUISHER, FIRE (81348) OE910	EA
B-1	16	5120-00-596-1071	FACE, HAMMER, INSERTED 1 1/2" DIA med plastic. (81348) GGG-H-33	EA
B-1	17	5120-00-596-1075	FACE, HAMMER, INSERTED 1 1/2" DIA TOUGH PLASTIC (81348) GGG-H-33	EA
B-1	18	6545-00-922-1200	FIRST AID KIT, GENERAL PURPOSE (19204) FIRST-AID	EA
B-1	19	6230-00-264-8261	FLASHLIGHT: ELECTRIC, HAND (81349) MIL-F-3747	EA EA
B-1	20	5120-00-061-8546	HAMMER, HAND BALL-PEEN, 2 LBS (81348) GGG-H-86	
B-1	21	1005-00-402-2200	HEAD, BELL RAMMER (19206) 8766006	EA

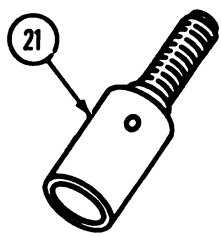
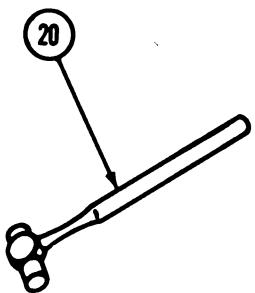
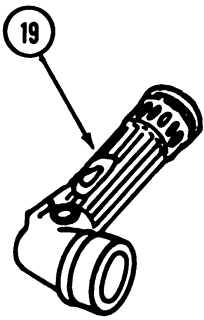
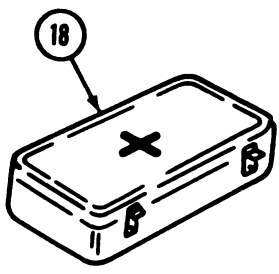
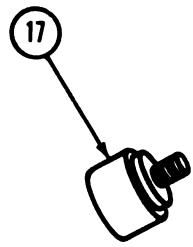
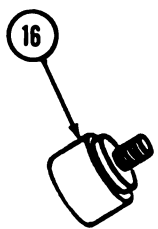
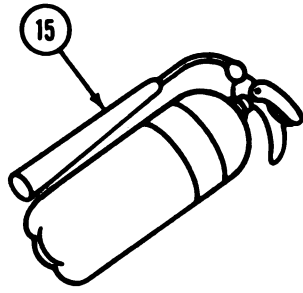
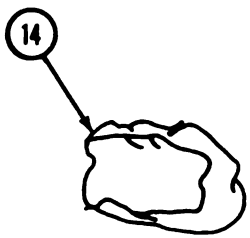
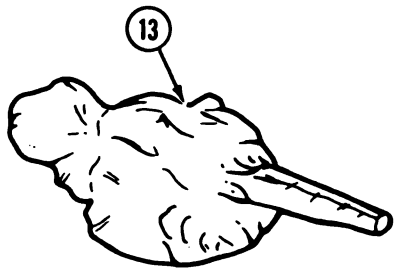
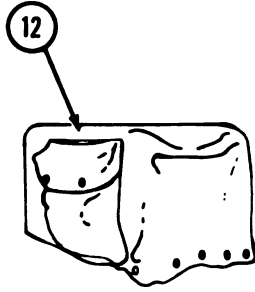
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1)		(2)	(3)	(4)	(5)
ILLUSTRATION		National Stock Number	Description FSCM and Part number	U/M	Qty rqr
FIG NO	(B) ITEM NO				
B-1	22	5965-00-182-3384	HEADSET, ELECTRICAL (81134) H251U	EA	1
B-1	23	5120-00-903-8555	HOLDER, INSERTED HAMMER (81348) GGG-H-33	EA	1
B-1	24	4720-00-814-0321	HOSE ASSEMBLY (RUBBER, FOR APU) (88044) AN6270-4D1440	EA	1
B-1	25	5120-00-224-2504	KEY, SOCKET HEAD SCREW, HEX DRIVE, L-TYPE, 7/16 IN. (81348) GGG-K-275	EA	1
B-1	26	5120-00-224-4659	KEY, SOCKET HEAD SCREW, HEX DRIVE L TYPE HDL, 1/4 IN. (81348) GGG-K-275	EA	1
B-1	27	1005-00-936-5387	LEAD, ELECTRICAL (W-11) (19204) 8437142	EA	1
B-1	28	4925-00-787-9803	LINKER-DELINKER, (M25) (19205) 8437142	EA	1
B-1	29	8415-01-092-0039	MITTEN, HEAT CLOTH (ASBESTOS) (81349) MIL-M-11199F	EA	2

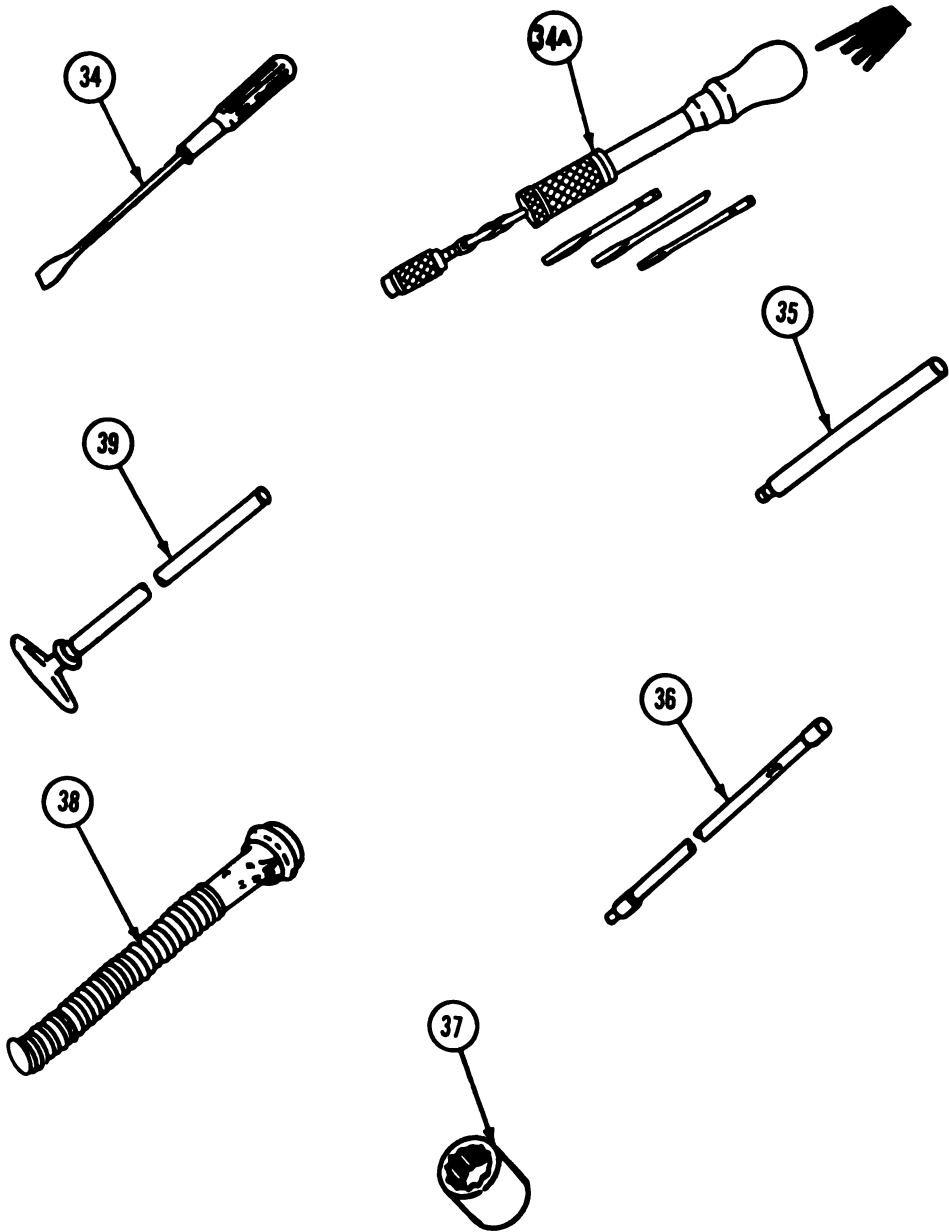
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
FIG NO	ITEM NO				
B-1	30	1290-00-891-9999	QUADRANT. FIRE CONTROL, W/CASE (19200) 7197156	EA	1
B-1	31	1005-01-203-7834	RANGE CONTROL ASSEMBLY (19200) 9361166	EA	1
B-1	32	5975-00-878-3791	ROD, GROUND (81349) MILR11461	EA	1
B-1	33	2990-00-972-7950	ROPE, STARTER, ENGINE (02978) ER02520	EA	1

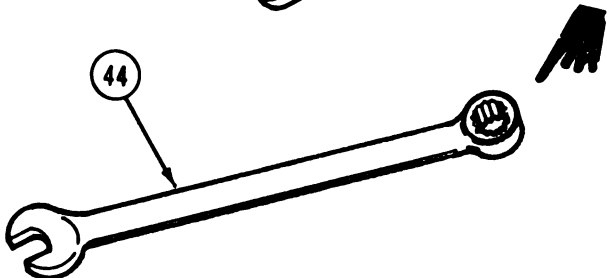
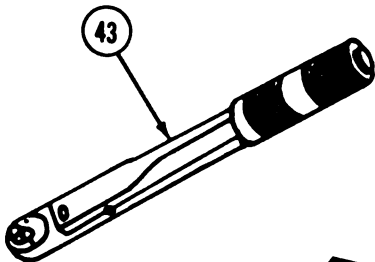
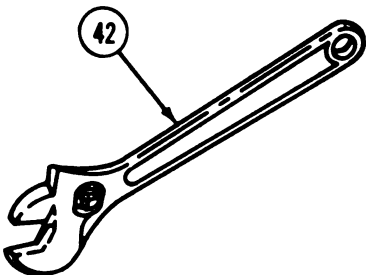
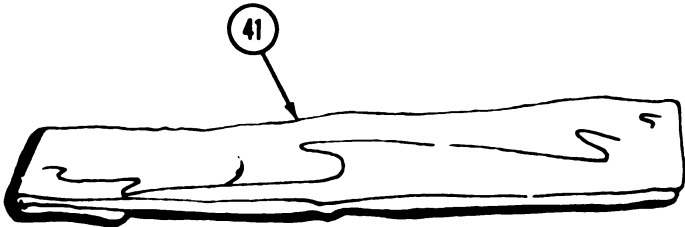
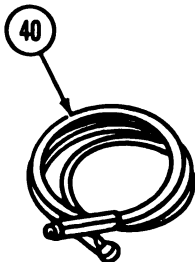
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
FIG NO	ITEM NO				
B-1	34	5120-00-010-7915	SCREWDRIVER, FLAT TIP 1/4 in. Tip 5 3/4 in. lg. (81348) GGG-S-121	EA	1
		5120-00-596-8502	SCREWDRIVER, FLAT TIP (81348) GGG-S-121	EA	1
		5120-00-278-1276	SCREWDRIVER, FLAT TIP (96906) MS15432-4	EA	1
B-1	34A	5120-00-221-7079	SCREWDRIVER, RACHET (81348) GGG-S-121	EA	1
B-1	35	1005-00-709-7668	SECTION ASSEMBLY, BRUSH (19205) 8766014	EA	3
B-1	36	1015-00-790-3611	SECTION END, CLEANING (19206) 8766008	EA	1
B-1	37	5120-00-189-7935	SOCKET, SOCKET WRENCH (1/2 sq. in. drive, 12 pt, 15/16 in. opng) (81348) GGG-W-641	EA	1
B-1	38	7240-00-177-6154	SPOUT, CAN, FLEXIBLE CAM TYPE 16 LG, 2-1/4 in. OD CAM, 1.238 in. OD TUBE (81349) MIL-S-1285	EA	1
B-1	39	1010-00-832-9153	STAFF, CLEANING (19204) 11687054	EA	1

BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1)		(2)	(3)	(4)	(5)
ILLUSTRATION		National Stock Number	Description FSCM and Part number	U/M	Qty rqr
(a) FIG NO	(b) ITEM NO				
B-1	40	1005-00-824-4485	SWITCH AND LEAD ASSEMBLY (19204) 8437361	EA	1
B-1	41	8340-00-817-2126	TARPAULIN (81348) KP146	EA	1
B-1	42	5120-00-264-3796	WRENCH, ADJUSTABLE OE, SGLE HD, 1.322 in., JAW OPENING 12 LG (19207) 11655778-5	EA	1
B-1	43	5120-00-294-9505	WRENCH, TORQUE 100-750 IN LB. 3/8" SQ-DR (81348) GGG-W-00686	EA	1
B-1	44	5120-00-228-9505	WRENCH, BOX OPEN END 7/16 (18702) 1214	EA	1
B-1	44	5120-00-228-9511	WRENCH, BOX OPEN END 13/16 (18702) 1167A	EA	1
B-1	44	5120-00-228-9512	WRENCH, BOX OPEN END 7/8 (18702) 12281	EA	1
B-1	44	5120-00-228-9514	WRENCH, BOX OPEN END 1 IN. (18702) 1232	EA	1

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

SECTION I . INTRODUCTION

C-1. Scope. This appendix lists additional items you are authorized for the support of the M167A2 towed air defense gun.

C-2. General. This list identifies items that do not have to accompany the M167A2 towed air defense gun and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. Explanation of Listing. National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

SECTION II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION FSCM & PART NUMBER USABLE ON CODE	(3) U/M	(4) QTY AUTH
<u>MTOE AUTHORIZED ITEMS</u>			
1005-00-504-3839	ADAPTER, COUPLER (19204) 8438335	EA	1
5140-00-653-4198	CHEST, TOOL (19204) 6534198	EA	1
5310-00-073-2076	NUT, PLAIN, SLOTTED, HEXAGON (19204) 8433599	EA	1
5315-00-187-9591	PIN, COTTER (96906) MS24665-689	EA	1
5120-00-256-2150	PLIERS: duck bill, 6 in. lg (81348) GGGP471	EA	1
8110-00-142-9336	TUBE, MAILING, AND FILING WATERPROOF TELESCOPIC W/CAPS: 4-in. inside dia, 43 in. long (81348) PPPT495	EA	1
5310-00-983-6974	WASHER, FLAT (19204) 8433595	EA	1

ADDITIONAL AUTHORIZATION LIST - Continued

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION FSCM & PART NUMBER USABLE ON CODE	(3) U/M	(4) QTY AUTH
<u>CTA AUTHORIZED ITEMS</u>			
5110-00-293-2336	AX, SINGLE BIT (81348) GGG-A-926	EA	1
5140-00-473-6256	BAG, TOOL, SATCHEL (81349) MIL-B-43663	EA	1
1240-00-930-3833	BINOCULAR (19200) 10547052	EA	2
7240-00-242-6153	CAN, WATER, MILITARY 5 GAL CAN (81349) MIL-C-13984	EA	1
5120-00-224-1390	CROWBAR (STYLE 1, SECT K) (81348) GG-B-101	EA	1
5110-00-595-8229	CUTTER, WIRE ROPE (81349) MIL-C-386	EA	1
1305-00-157-4616	DUMMY, CARTRIDGE 20-MM (100 rd box) (19201) 725950	EA	2
5120-00-288-6574	HANDLE, MATTOCK (81348) NN-H-93	EA	1
5120-00-243-2395	MATTOCK (PICK TYPE) (19207) 11677022	EA	1
5340-00-682-1508	PADLOCK (PIN TUMBLER TYPE) (96906) MS35647-3	EA	1
3985-00-498-8343	REELING MACHINE (81349) MILR3206	EA	1
5120-00-293-3336	SHOVEL, HAND (RD POINT) (81348) GGG-S-326	EA	1
5805-00-543-0012	TELEPHONE SET (81349) TA312PT	EA	1

APPENDIX D

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

SECTION I. INTRODUCTION

D-1. Scope. This appendix lists expendable/durable supplies and materials you will need to operate and maintain the M167A2 towed air defense gun. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

D-2. Explanation of Columns.

a. **Column 1 - Item number.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e. g., "Use cleaning compound, Item 2, App D").

b. **Column 2 - Level.** This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew

O - Organizational Maintenance

c. **Column 3 - National Stock Number.** This is the National stock number assigned to the item; use it to request or requisition the item.

d. **Column 4 - Description.** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. **Column 5 - Unit of Measure (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

SECTION II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
1	C	6135-00-120-1020	BATTERY, DRY 1.5V (BA-30) (96906) MS75059	EA
2	C	6850-00-597-9765 6850-00 274-5421	CLEANING COMPOUND, SOLVENT SD-2 (80063) 6G236-6 1 GAL CAN 5 GAL CAN (81348) P-D-680	GL
3	C	9150-01-054-6453	CLEANER/LUBRICANT/ PRESERVATIVE, CLP (81349) MIL-L-63460 1 pt (spray bottle)	PT

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
4	C	8305-00-267-3015	CLOTH, CHEESECLOTH 36 IN. WIDE (81348) CCCC440	IN.
5	C	8010-00-081-0809	ENAMEL (81348) TTE529	QT
6	C	8010-00-080-2173	ENAMEL (GREEN) (81348) TTE529	QT
7	C	8010-00-181-7402	ENAMEL (OLIVE DRAB) (81349) MILE46136	PT
8	C	9150-00-190-0905	GREASE, AUTOMOTIVE AND ARTILLERY (GAA) (81349) MIL-G-10924 5 LB CAN	LB
9	C	9150-00-935-4017	GREASE, AIRCRAFT (INSTRUMENT) GIA (81349) MIL-G-23827 8 OZ TUBE	OZ
10	C	9150-01-071-0749	GREASE, AIRCRAFT ORD (07950) XP-190	CN
11	C	9150-00-935-9807 9150-00-935-9808	HYDRAULIC FLUID, PETROLEUM BASE OHT, (81349) MILH6083 1 QT CAN 1 GAL CAN	QT GL

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
12	C	6240-00-763-7744	LAMP, INCANDESCENT (81348) W-L-00111/7	EA
13	C	6240-00-155-7836	LAMP, INCANDESCENT (06906) MS25237-327	EA
14	C	6240-00-997-4559	LAMP, INCANDESCENT (08806) 835	EA
15	C	6240-00-155-6707	LAMP, INCANDESCENT (81348) W-L-00111/59	EA
16	C	9150-00-142-8308	LUBRICANT, SOLID FILM SFD (19204) RIAPD703 12 OZ CAN	OZ
17	C	9150-00-834-5808	LUBRICANT, SOLID FILM SFD (81349) MILL8937 1 PT CAN	PT
18	C	9150-00-231-8608	LUBRICATING OIL, GENERAL PURPOSE, PRESERVATIVE, PL S (81348) VVL800 1 QT CAN	QT
19	C	9150-00-231-2361	LUBRICATING OIL, GENERAL PURPOSE PRESERVATIVE, MEDIUM, PL-M (81349) MILL3150 1 QT CAN	QT
20	C	9150-00-949-8323	LUBRICATING OIL, SEMI-FLUID, LSA-T (81349) MIL-L-46150 8 OZ TUBE	TU
21	C	9150-00-889-3522	LUBRICATING OIL, SEMI-FLUID, AUTOMATIC WEAPONS, LSA (81349) MILL46000 4 OZ BOTTLE	OZ
21A	C	9150-01-104-5227	LUBRICANT, ALL WEATHER AUTOMATIC WEAPONS, (LAW-AW) (81348) DOD-L-85336A	

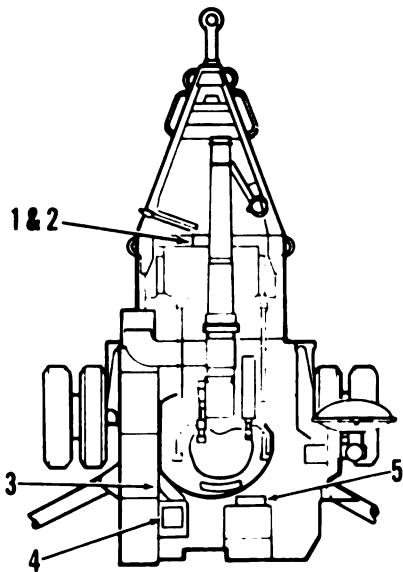
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
22	C	5350-00-221-0882	PAPER (ABRASIVE, 9 IN. BY 11 IN. SHEETS) (58536) A-A-1201 100 EA PER PGK	EA
23	C	6640-00-597-6745	PAPER LENS (81348) NNNP40 50 EA PER BX	EA
24	C	8010-00-515-2211	PRIMER COATING YELLOW (81348) TT-P-1757 5 GAL CAN	GL
25	C	8010-00-264-7857	PRIMER COATING (81349) MILE48127 1 PT CAN	PT
26	C	7920-00-205-1711	RAG: wiping (58536) A-A-531 50 lb bale	LB
26A	C	6850-00-224-6663	RIFLE BORECLEANING (RBC) (81348) MIL-C-372	GL
27	C	8030-00-889-3534	TAPE, ANTISEIZING (260 IN. LG ROLL, IN DISPENSER) (81349) MIL-T-227730	EA

APPENDIX E STOWAGE AND SIGN GUIDE FOR COMPONENTS OF END ITEM, BASIC ISSUE ITEMS, AND APPLICABLE ADDITIONAL AUTHORIZATION LIST

E-1. Scope. This appendix shows the locations for stowage of equipment and materiel required to be carried on the M167A2 towed air defense gun.

E-2. General. Locations of mounted or stowed basic issue items and additional authorization list items are shown in this appendix. Other items not shown in this appendix are stowed on the prime mover or stowed at the discretion of the chief of section.



TOP VIEW

NO.	STOWAGE PLAN
	ITEM
1	Linker delinker
2	Cable assembly (8437142)
3	Telephone set
4	Boresight kit
5	Gunner's quadrant

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CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

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Artillery, Towed (PIVADS), M167A2.

CHANGE

NO. 5

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 4 August 89

OPERATOR'S MANUAL (CREW)

FOR

GUN, AIR DEFENSE ARTILLERY,
TOWED
20-MM, M167A2
(NSN 1005-01-177-9237)

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2-65 through 2-68
2-71 through 2-76
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2-111 and 2-112
3-5 through 3-8
3-11 through 3-14
3-25 and 3-26
None
3-33 and 3-34

Insert Pages

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2-11 through 2-16
2-49 through 2-52
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2-71 through 2-76
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3-11 through 3-14
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3-101 and 3-102
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Washington, D.C., 31 October 1990

OPERATOR'S MANUAL (CREW)

FOR

GUN, AIR DEFENSE ARTILLERY,

TOWED:

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